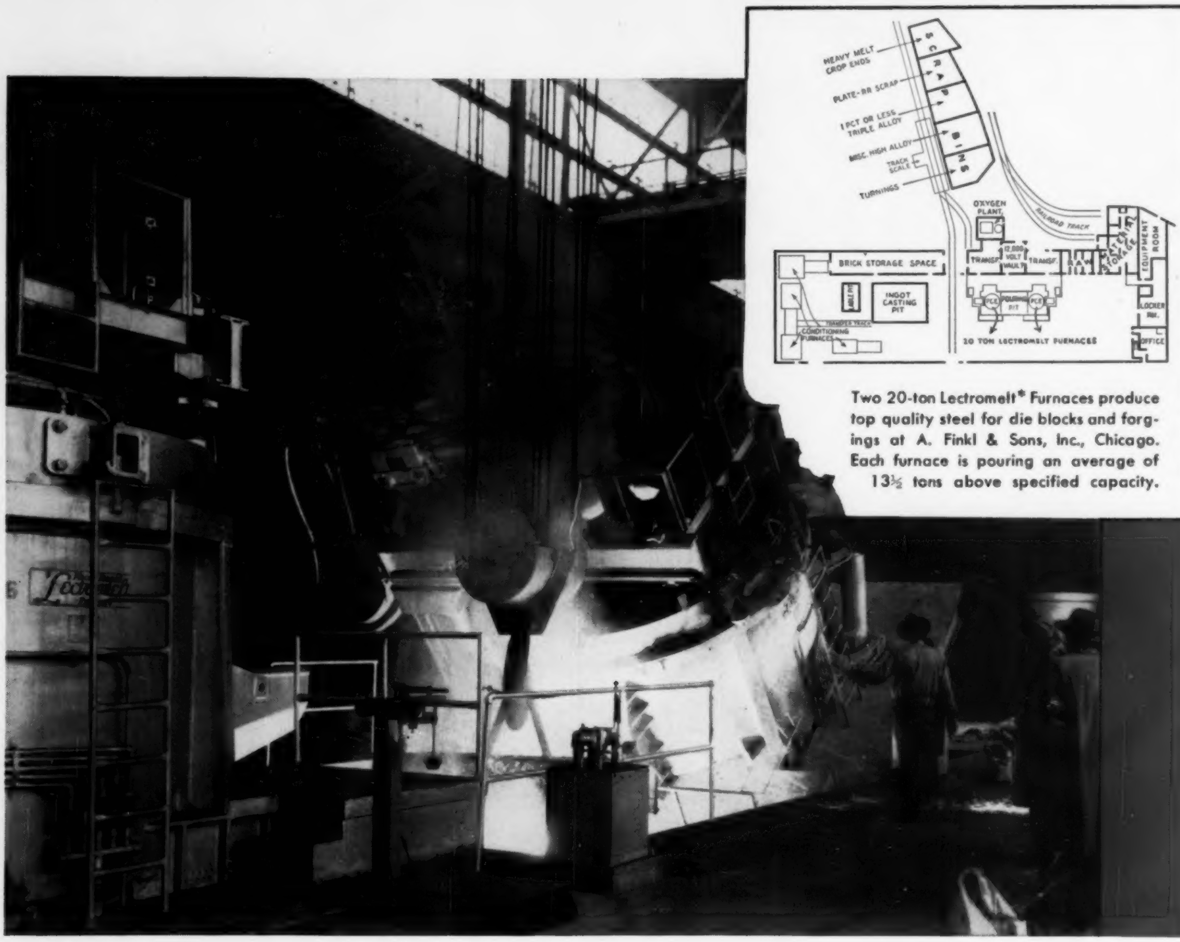
The Foundrymen's Own Magazine

American Foundryman

February 1954



Two 20-ton Lectromelt* Furnaces produce top quality steel for die blocks and forgings at A. Finkl & Sons, Inc., Chicago. Each furnace is pouring an average of 13½ tons above specified capacity.

rated at 20 tons, *Averaging 33½ tons* in Finkl's new melt shop!

"They're sturdy," says Dave Hughes, Finkl's Melt Shop Superintendent, "so we felt safe in boosting the output of these two 20-ton Lectromelt Furnaces to as high as 40 tons. Our monthly average has been 33½ tons."

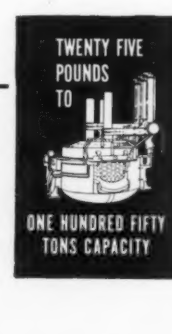
Finkl's Lectromelt Furnaces top-charge in 6 minutes . . . pour heats in 3½ to 4½ hours. Downtime between heats is only 25 minutes.

Your furnaces are the heart of your melting, smelting or reduction operation. They can be sturdy and dependable. Write for Bulletin No. 9 describing Lectromelt Furnace operation. The Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID *Lectromelt*



American Foundryman

Volume 25 **February 1954** *Number 2*

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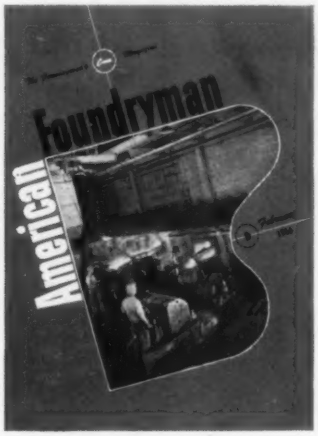


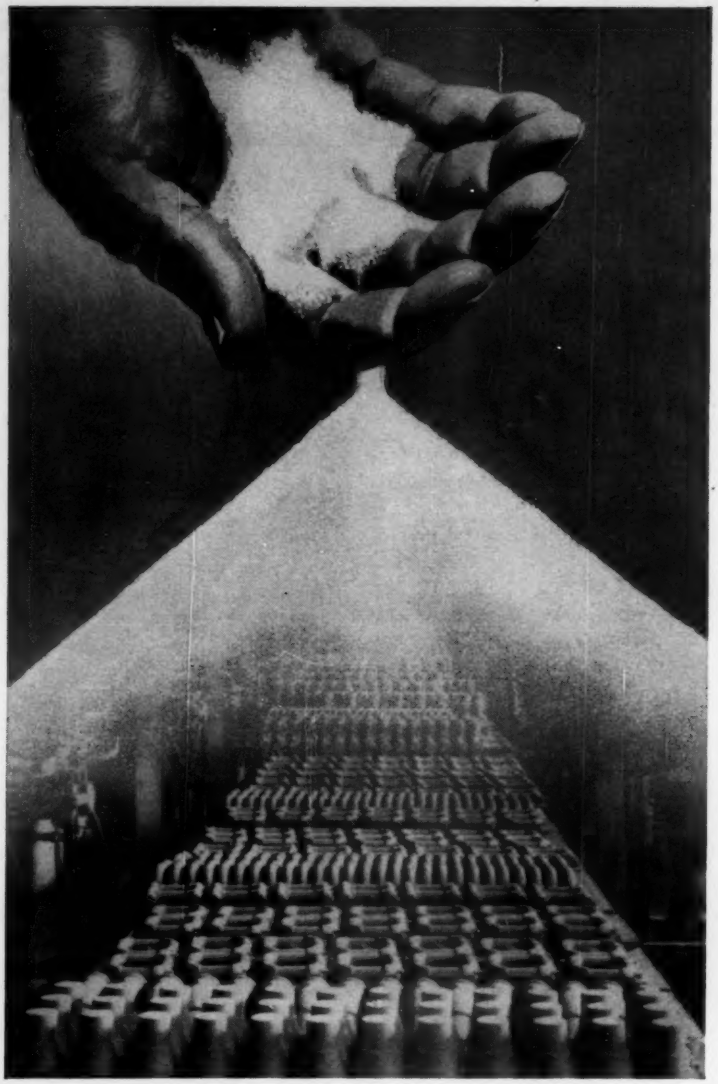
Molten metal is transferred to pourers by lift truck at Belle City Malleable Iron Co., Racine, Wis. Iron is melted in cupolas and tapped continuously into air furnaces where temperature and composition adjustments are made.

In This Issue . . .

Departments . . .

Published monthly by the American Foundrymen's Society, Inc., 616 S. Michigan Ave., Chicago 5. Subscription price in the U.S., Canada and Mexico $5.00 per year; elsewhere, $6.00. Single copies 50c. Convention copies $1.00. Entered as Second Class Matter, July 22, 1938, under Act of March 3, 1879, at the Post Office, Chicago.

about Tenn-Sil sand additive



Try it! Ask your nearby TENNESSEE metallurgical engineer for a sample of Tenn-Sil sand additive. Discover for yourself how it will help you reduce casting defects.

Helps cut casting defects

● Foundries are finding TENNESSEE Tenn-Sil the key to better castings. This sand additive controls expansion in the mold and minimizes casting defects. It is available in two types:

Tenn-Sil No. 1 . . . replaces wood floor and sea coal in the sand mix. Graded to approximately AFA No. 100 size. By increasing hot deformation it helps eliminate defects such as rat tails, buckles and certain types of scabs. It is also used for insulating the molten metal in the ladle when delays in pouring occur.

Tenn-Sil No. 2 . . . replaces silica flour. It has a fineness of 325 mesh. It offers important advantages over silica flour for quality of cores and for steel facing. It has no free silica and therefore presents no silicosis hazard in itself.

Mail the coupon today for complete information on these products.

MAIL COUPON TODAY!

TENNESSEE PRODUCTS & CHEMICAL CORPORATION
Department F-2, Nashville, Tennessee

Please send data bulletin on new Tenn-Sil sand additives.

Name ....

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Company ....

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PRODUCTS & CHEMICAL
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NASHVILLE, TENNESSEE

Producers of: **FUELS • METALLURGICAL PRODUCTS • TENSULATE BUILDING PRODUCTS • AROMATIC CHEMICALS • WOOD CHEMICALS • AGRICULTURAL CHEMICALS**

Talk of the Industry

REFRACTORY MOLDS that are poured as a slurry over hard plaster patterns, then suddenly gel to rubbery consistency ready for ignition are the key to a new British casting process. Present applications involve casting of all types of alloys including those difficult to machine. Castings are reported to be produced with a fine, "die-cast" finish consistently to limits of 0.005 in. Largest casting to date is steel, weighs 35 lb. Possibly already cast is one weighing 130 lb. Major drawback at present is high cost of mold material, representing 75 per cent of the cost of materials and labor.

GOOD YEAR IN 1954 is forseen by Homer E. Robertson, executive vice-president, Cast Iron Soil Pipe Institute, due to continued demand for housing and failure of substitute materials to satisfy service requirements as cast iron does. General employment is expected to have a favorable influence on home buying. Down-trend in automotive employment will reverse as high 1953 production is absorbed in early months of 1954; auto industry employees will then swell the demand for homes, Robertson feels. This would return a real benefit to the automobile business since building tradesmen often drive long distances to construction jobs. In addition, new home developments, when first started and sometimes permanently, are often dependent on automobiles for transportation.

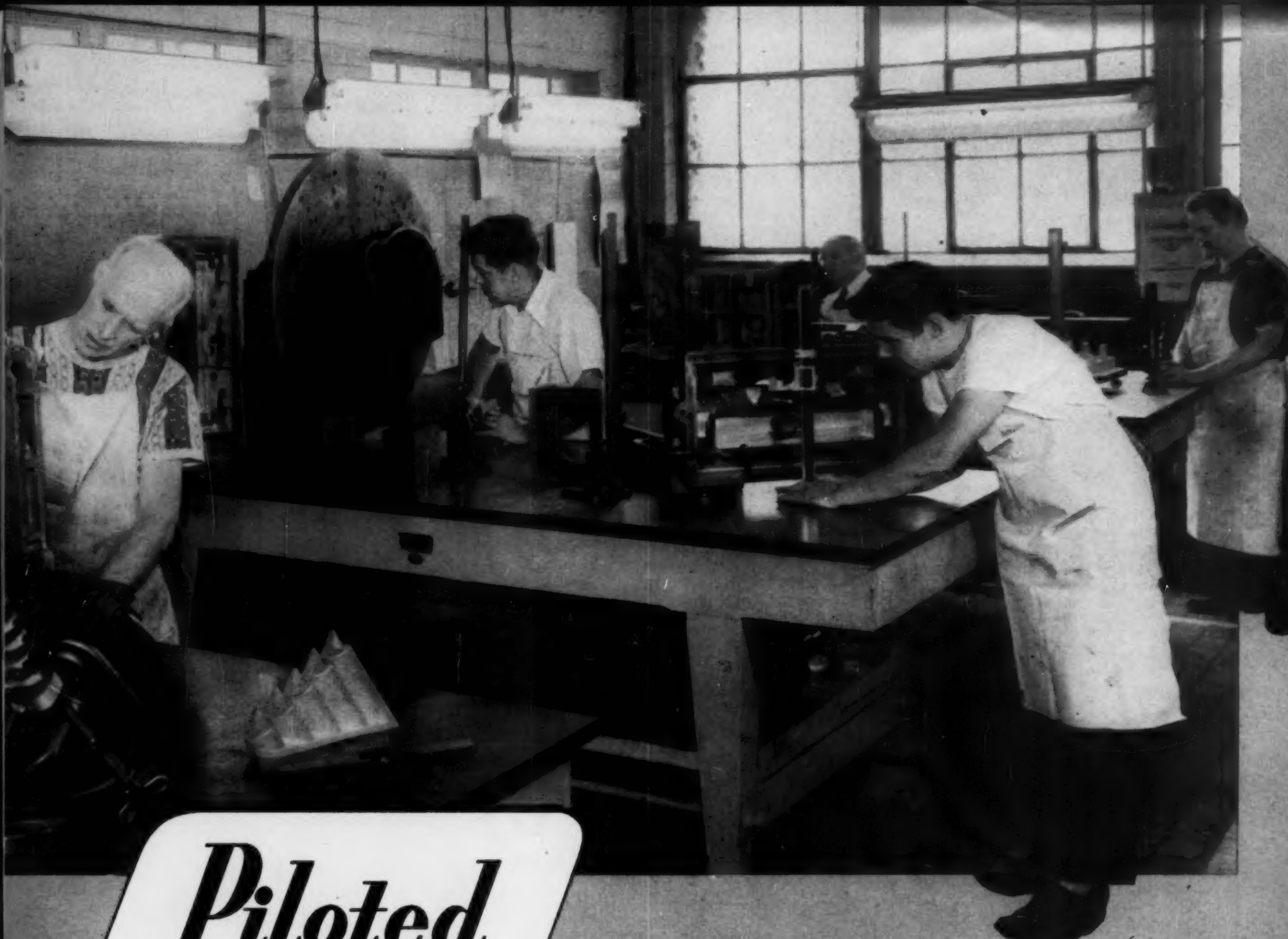
SLUDGE FROM WET DUST COLLECTORS is being added to sand mixtures (1-2 gallons per 1000 lb batch) in several foundries. Object is to return fines and unspent bond to the molding sand. Also saves cost of hauling sludge to the dump.

FOUNDRY INDUSTRY'S SUPPLY of engineering graduates is barely 42 per cent of its needs according to estimates of E. J. Walsh, executive director, Foundry Educational Foundation. Nevertheless, progress has been made in increasing the influx of engineering graduates since 1947 when F.E.F. was organized. Among gains in 14 participating schools are an increase $1,047,500 in value of foundry teaching facilities due to university funds and gifts; an increase in foundry teaching services of 1/3 of a million dollars annually due to increased academic staff; an increase in number of foundry courses from 14 to 96; and an increase in proportion of engineering students taking foundry courses from 8.5 to 19.1 per cent.

INJURY FREQUENCY RATES in Tennessee and Kentucky have gone down 41 per cent and 23 per cent, respectively, as a result of special six-month safety programs. Of the 49 Tennessee foundries participating, 13 completed the program without a disabling injury; 11 others had a frequency rate reduction of 50 per cent or more. Nine of the 24 Kentucky foundries in the program completed the six-month period without a disabling injury.

TITANIUM CASTING, confined to simple shapes poured in graphite molds in its earliest stages of development, is reported being successfully done in shell molds.

HOW MUCH INFLUENCE does the metal have on development of hot tears? During an AFS committee meeting, a member recalled the observation of an old timer who used to point out that when metal runs down the furnace spout it doesn't contain any blows, hot tears, etc., therefore, sand, molding, and cores must be at fault.



Piloted Precision ...from Print to Pattern

Translating precision from your blueprints into patterns is the function of our layout and inspection department. Here skilled hands carefully pilot your patterns through every operation performed on them. The latest methods and the finest equipment are used in this important work. Only through such painstaking layout and inspection can unvarying high quality be maintained . . . and it is on such quality that City Pattern Foundry & Machine Company has built its reputation.

"Piloted precision" is another reason why leading manufacturers rely on City Pattern Foundry & Machine Company for the utmost in accuracy, economy and production utility in wood and metal patterns.

City Pattern Foundry & Machine Company's Shrinkage Conversion Tables save time and eliminate errors in shrinkage calculations. Your letterhead request will bring a set of these handy tables without obligation.

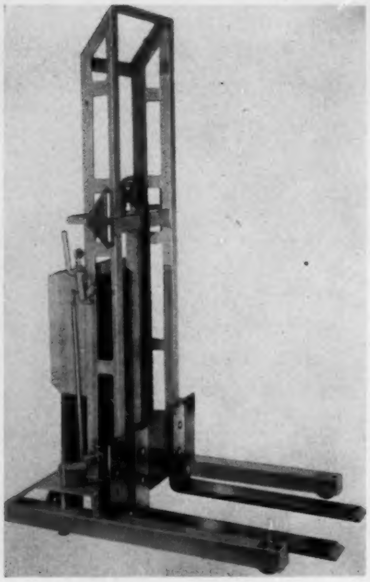
CITY PATTERN
FOUNDRY AND MACHINE CO.

1161 HARPER AVENUE • DETROIT 11, MICHIGAN

Setting the Pattern In Patterns

Products and Processes

continued on page 10



Portable Lift-Truck

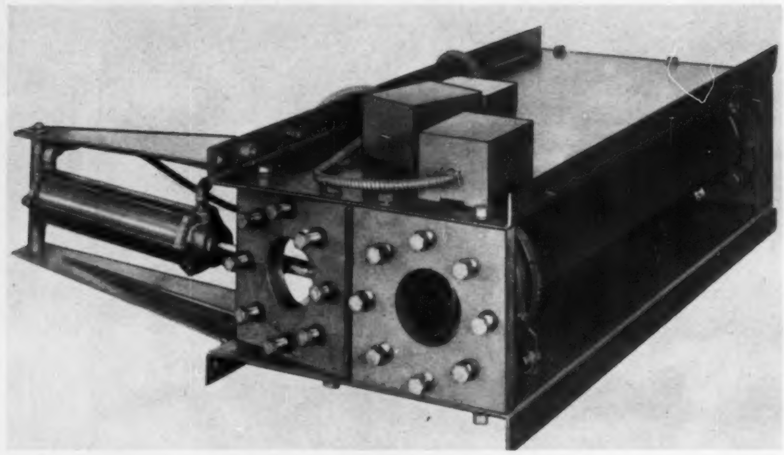
New model electric portable lift-truck is designed as "4-in-1" unit: operates as fork-lift, straddle-lift, platform-lift, and drum-stacker with lifting capacity of 1250 lb. For maximum economy, unit includes many features proven through use in other models: snap-on platform, powerful hydraulic cylinder, built-in charger with automatic cut-off, kay-locked ignition switch, and electronic cut-off switch. *Safeway Industrial Equipment Co.*

For more data, circle no. 92, p. 17

Tough Flooring Compound

Recent improvement in Steelhard flooring compound enables it to withstand up to 20 tons, says manufacturer. Reputed to produce extra hard, smooth, resilient floor. Ready for use 4-6 hours after installation. Light gray color. *Monroe Co., Inc.*

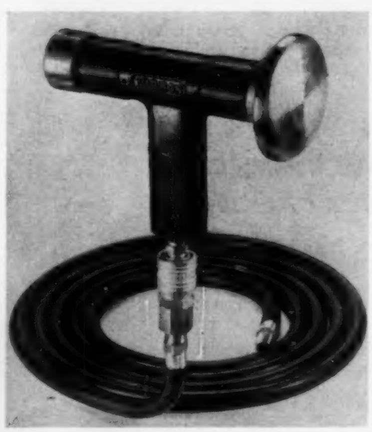
For more data, circle no. 93, p. 17



Pneumatic Sand Pipeline System

Whirl-Air-Flow pneumatic pipeline system for moving foundry sand has three main components: transporter, pipeline, and transfer switches. Capacity of system is determined by transporter, which is available in three sizes: 7½ cu ft, 15 cu ft, and 30 cu ft. Other main components determined by number of stations to be served. Instant push-button control of entire system. Standardized components keep initial investment low. *Gerwin Industries.*

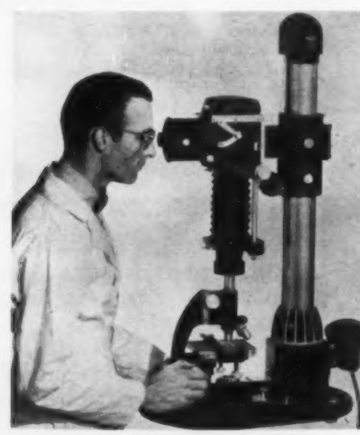
For more data, circle no. 94, p. 17



Pneumatic Gun

New, compact pneumatic refractory gun is designed to reduce cost of hand-applied refractory jobs. Said to require 40-50 per cent less moisture, produce longer-lasting linings or patches with reduced drying time, longer operating life of equipment. Automatic cycling, 4800 heavy strokes per minute, quiet action. Weighs only 5 lb, operates at greatest efficiency between 85-130 psi. *Vibron Div., Burgess-Sterbentz Corp.*

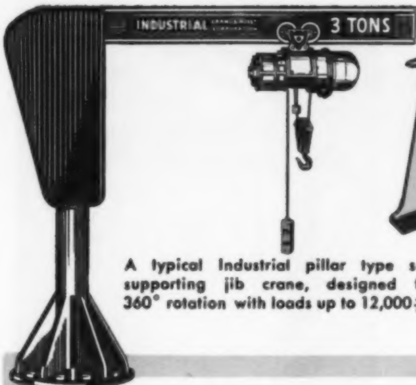
For more data, circle no. 95, p. 17



Versatile Photomicrography

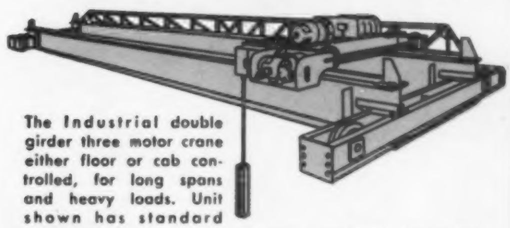
Completely integrated reflex camera and controlled light source is used with any standard microscope. Precision, permanent alignment, simplicity of design and operations claimed to make unit virtually automatic for use by personnel without special training. Finger-touch regulation of intensity, color temperature, and size of regulated field. Said to have simple, precise focusing device. *Silge & Kuhne.*

For more data, circle no. 96, p. 17



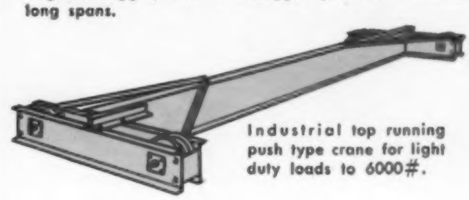
Industrial CRANES

A typical Industrial pillar type self supporting jib crane, designed for 360° rotation with loads up to 12,000#.

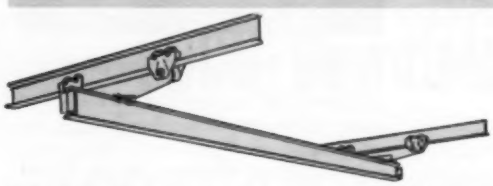


The Industrial double girder three motor crane either floor or cab controlled, for long spans and heavy loads. Unit shown has standard single outrigger; double outrigger provided for extra long spans.

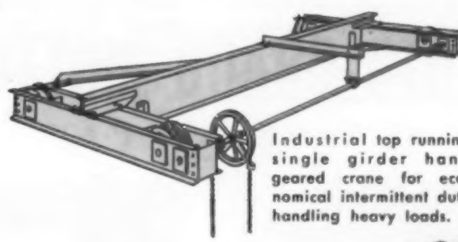
Industrial cranes are built in many types and sizes from small portable gantrys, up to 20 ton double girder motor driven overhead cranes all of welded steel construction. These cranes incorporate many patented features and are built to serve industry long and well. Consult Industrial Crane & Hoist Corporation for equipment that can simplify your material handling problems and increase your production.



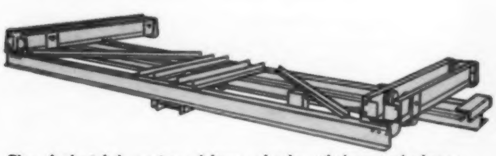
Industrial top running push type crane for light duty loads to 6000#.



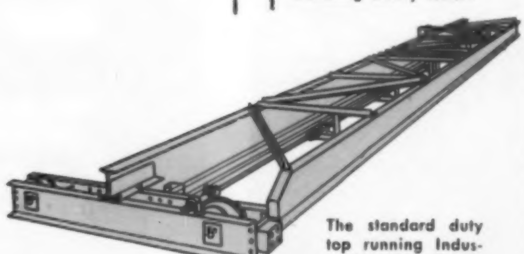
Industrial underhung push type crane for light duty—loads to 4000#.



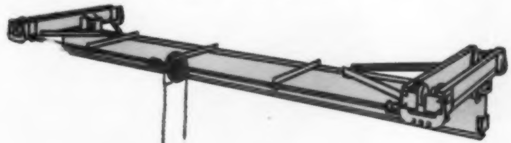
Industrial top running single girder hand geared crane for economical intermittent duty handling heavy loads.



The Industrial motor driven single girder underhung crane featuring the rigidity of outrigger construction. A standard design for loads up to 20,000#.



The standard duty top running Industrial single girder motor driven crane with typical rugged outrigger bridge construction designed to efficiently handle loads up to 20,000#.



The economical Industrial underhung single girder crane for loads up to 20,000# on intermittent duty basis.

WRITE FOR CATALOGS

Industrial CRANES

INDUSTRIAL CRANE & HOIST CORPORATION

(formerly Industrial Equipment Co.)

305 NORTH ADA STREET **CHICAGO 7, ILLINOIS**

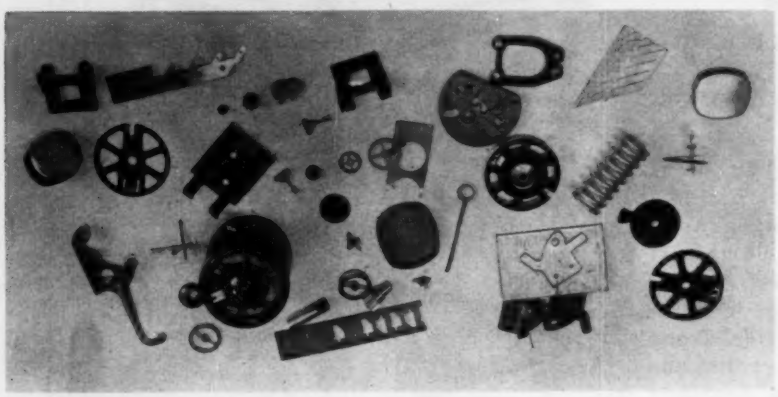
Overhead Cranes • Jib Cranes • Monorail Systems • Crane Runways

Representatives in Principal Cities

Products & Processes

For additional information, use postcard at bottom of page 17

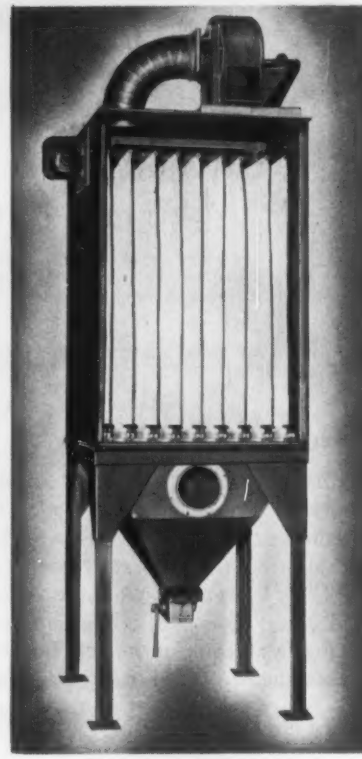
continued on page 12



Long-Life Barrel Finishing Chip

Unusually long life, ease of reaching hard-to-get-at indentations without clogging holes, and production of unusually fine finish to close tolerances, are claimed for Novaculite, finishing abrasive, by manufacturer. Mild honing abrasive action for smooth, even finish without dents, burrs. Above parts finished with new product. *Chicago Wheel & Mfg. Co.*

For more data, circle no. 97, p. 17



Unit Type Dust Collector

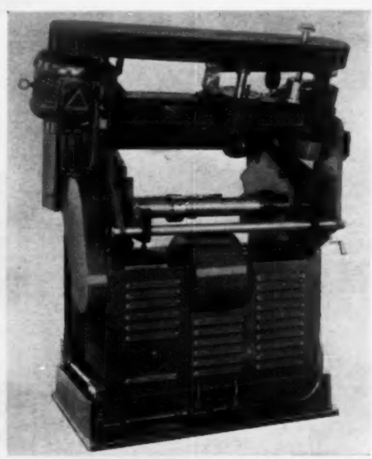
Designed for economical and efficient dust collection for smaller volume applications, unit-type cloth bag collector is shipped assembled, ready for installation, each unit self-contained. Seven sizes, ranging from 200-1000 sq ft of cloth area. Collector casings are manufactured of heavy-gauge steel. Removable doors, top and bottom, for bag removal. Cleaned air can be discharged inside plant, real saving in operations where air is heated or cooled. *Pangborn Corp.*

For more data, circle no. 100, p. 17

Bar Stock Handler

Used in handling and positioning of heavy bar stock, this Portelevator transports billets, height-positions them, and feeds stock directly to saw. Receives heavy billets at loading dock, transports them to stock room for storage. Table has capacity of 2000 lb, vertical travel of 14 in. Minimum height from floor is 20 in., maximum of 34 in. Elevated by hand crank from side to permit extension of bar stock over each end. Table surface measures 18 x 20 in. Versatile unit simplifies handling of heavy bar stock. *Hamilton Tool Co.*

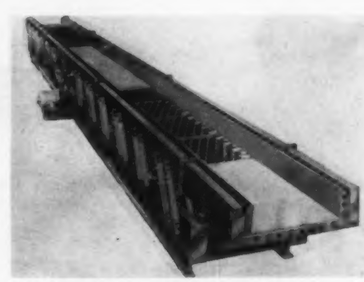
For more data, circle no. 98, p. 17



Semi-Automatic Tester

Semi-automatic Brinell testing machine said to require only half previous labor force; automatically indexes test pieces through both spot grinding and Brinell testing stations. Crankshafts, gun barrels, other shaft-like parts fed into machine at 400 per hour; slide out ready for inspection. Model RCB has 30-in. work opening, hydraulically operated, modified to specification. *Detroit Testing Machine Co.*

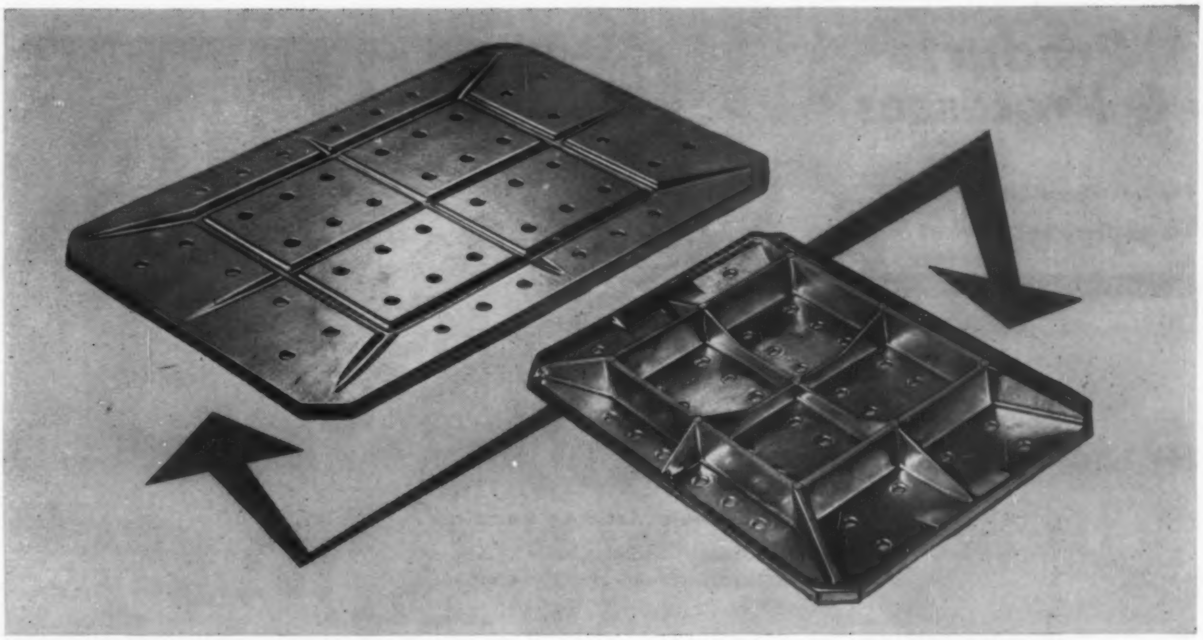
For more data, circle no. 99, p. 17



Balanced Conveyors

Balanced, dual trough vibrating conveyors and screens designed for bulk materials, hot or cold, dry or damp, abrasive or corrosive, any size. High amplitude, low frequency. 80-280 tons per hour. *Syntron Co.*

For more data, circle no. 101, p. 17



Look into both sides of the EDCO Dowmetal BOTTOM BOARD STORY...

—*The design side... and the dollar side*

Simple arithmetic is all you need to understand why the Edco Dowmetal Bottom Board story makes sense to a growing number of foundrymen. It's as simple as 1 plus 1 equals 2 . . . and 2 plus 2 equals 4.

Two main features, illustrated here, quickly tell the Edco design story . . . tell why Edco Bottom Boards produce better castings:

1. The flask side of an Edco Bottom Board is grooved and vented to permit escape of gases and to insure mold stability.

2. The opposite side is braced like a bridge, and the entire board is made of light-weight magnesium—gives you strength without weight for safe, easy handling and long board life.

That's the Edco design story.

Edco Dollar Story Makes Complete Sense, Too

When you switch to Edco Dowmetal Bottom Boards you'll find, like other foundries, that you have made a good move dollar-wise, too . . . for these reasons:

1. They pay for themselves. One foundry switched to Edco and cut its burning and breakage loss from 70% per year down to 3%. Another foundry kept a 5-year comparison record and found that under identical circumstances its wooden boards had a "casualty" record of 7500 boards lost, contrasted with a mere 12 for its Edco Dowmetal Boards. The same company found, further, that the scrap loss was 20% less with the Edco Boards.

2. You'll find that volume production of the most popular board sizes makes your original (and only) investment less than you'd normally expect.

That's the Edco dollar story.

It costs next to nothing to get the full dollars and cents story. A minute of time and a 3-cent stamp does it if you act now—but it might cost you a lot in savings lost if you put it off. Use the handy coupon.

CHRISTIANSEN CORPORATION

210 SOUTH MARION STREET
OAK PARK 2, ILLINOIS
ALUMINUM ALLOY INGOTS

Without obligation, please send price schedule and list of 83 standard sizes available from stock.

Name__________

Title__________

Company__________

Address__________

City-Zone-State__________

Products & Processes

For additional information, use postcard at bottom of page 17

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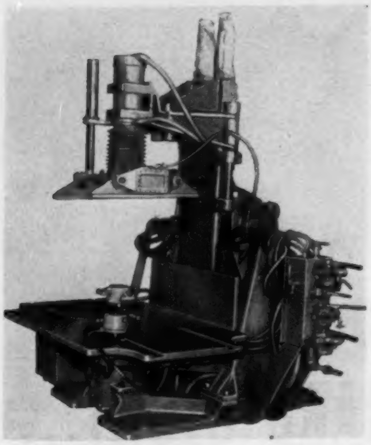


Automatic Pattern Clamping

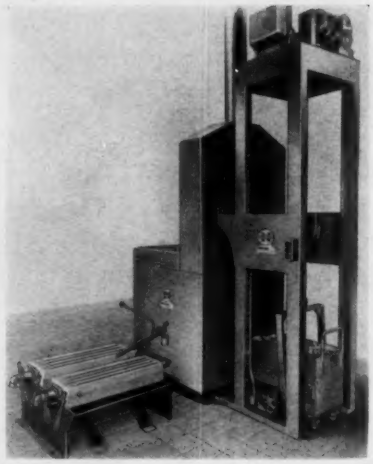
Automatic pattern clamping device firmly air-clamps pattern to table, allowing change without loosening or tightening bolts or clamps. Several of firm's molding machines available with device. *Beardsley & Piper.*

For more data, circle no. 102, p. 17

Cover Goggles

This new cover goggle made to fit over large-frame glasses. Improved ventilation, enlarged visual area. Uses standard 50 mm round lenses; has aluminum rims and side shields to eliminate glare. *American Industrial Safety Equipment Co.*

For more data, circle no. 103, p. 17



Automatic Loading Remelter

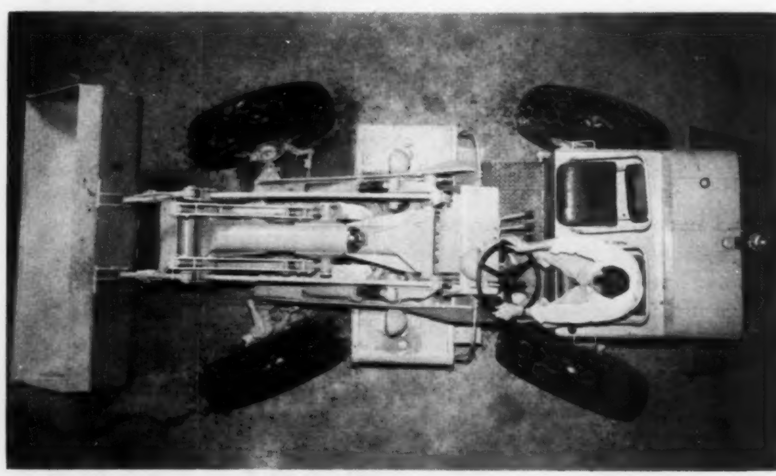
Automatic loading device makes remelting operation almost entirely automatic in this self-contained unit. Handles soft metals. Regularly furnished for 850 F, may be equipped to 1000 F. Automatic temperature control, preheating time switches optional. Pot capacities 600 lb to 5 tons. Standard unit complete and compact, equipped with hinged cover, ventilating pipe connection, bottom draw-off valve with swing spout and heating equipment. May be heated by electricity, oil, or any type of gas. Furnace supplied in various shapes, permitting custom installation. *Nolan Corp.*

For more data, circle no. 104, p. 17

Depressed-Center Wheel

New Carboflex depressed center grinding wheel performs numerous maintenance and production jobs. Reputed to be versatile, combining aggressive cutting action with maximum safety factor. Resin bond wheel, glass-fiber reinforced, useful for rough grinding, weld removal, cut-off and slotting operations for ferrous and non-ferrous metals. Said to offer extremely high strength and excellent resistance to cracking in heavy production use. *Carborundum Corp.*

For more data, circle no. 105, p. 17



Easy Turning Truck

Four-wheel steering on new materials handling Shoveloader uses same steering principle as hook-and-ladder fire truck. Despite 19-ft length, has inside turning radius of only 7 ft 6 in. Positive four-wheel drive and elimination of center differential in transfer case give high under clearance. Operates on extreme conditions of mud, snow, sand, uneven ground, says manufacturer. Seat at rear, above engine, away from all moving parts. Full weight placed on rear wheels of truck for positive traction. *Baker-Lull Corp.*

For more data, circle no. 106, p. 17

Foster Machine Company reports:

Up to 50% lower costs through shell molding

various textile machine parts

using

MONSANTO'S RESINOX 736 RESIN

Truer, cleaner castings produced from shell molds bonded with Resinox 736 resin resulted in over-all savings of 15% on this textile machine part, cast by Shell Process, Inc., Chicopee, Mass. for the Foster Machine Co., Westfield, Mass. Savings up to 50% are being realized on other parts now being shell molded for Foster.

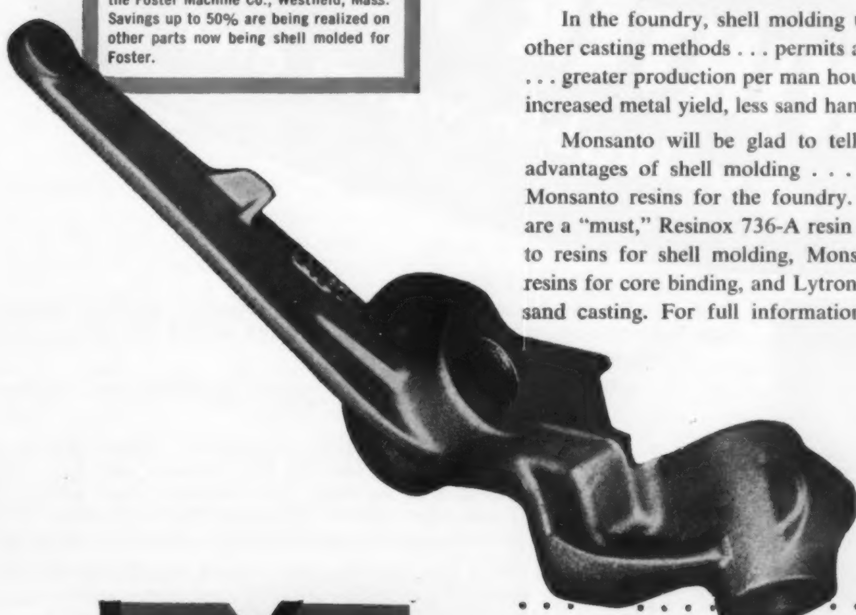
How does shell molding cut costs? From their experience, Foster reports . . . "partly from less hand and machine finishing than required with conventional casting methods; partly from faster rig-up time."

For the user, shell molding in practice delivers castings with surface finish *superior* to that of any similar casting made in a sand mold. This means large savings on clean-up . . . in some cases a 100% reduction! Castings, too, are produced to closer tolerances, with good detail on intricate shapes and thin sections.

In the foundry, shell molding usually increases productivity over other casting methods . . . permits a more compact, efficient operation . . . greater production per man hour with unskilled help. Other gains: increased metal yield, less sand handling, cleaning and grinding.

Monsanto will be glad to tell you more about the cost-saving advantages of shell molding . . . and the particular advantages of Monsanto resins for the foundry. For example, where stiffer shells are a "must," Resinox 736-A resin might be your answer. In addition to resins for shell molding, Monsanto produces phenolic and urea resins for core binding, and Lytron sand conditioner for conventional sand casting. For full information, mail the handy coupon today.

Resinox, Lytron: Reg. U. S. Pat. Off.



MONSANTO

SERVING INDUSTRY...WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY,
Plastics Division, Room 5602,
Springfield 2, Mass.

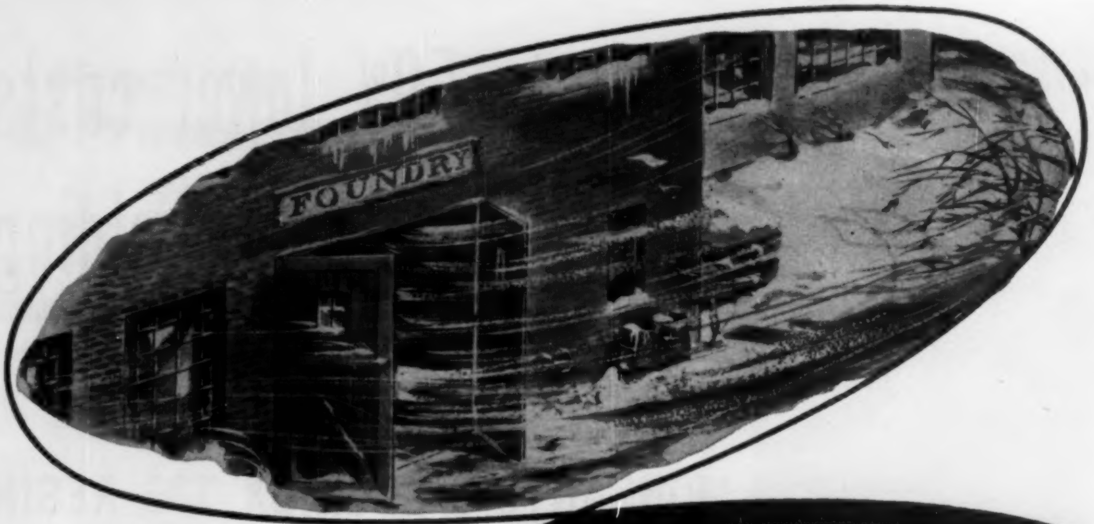
Please send me your booklet, "The Shell Molding Process."
Also, please send me information on: ☐ Monsanto resins for shell molding; ☐ Monsanto resins for core binding; ☐ Monsanto Lytron Sand Conditioner.

NAME & TITLE ____________________

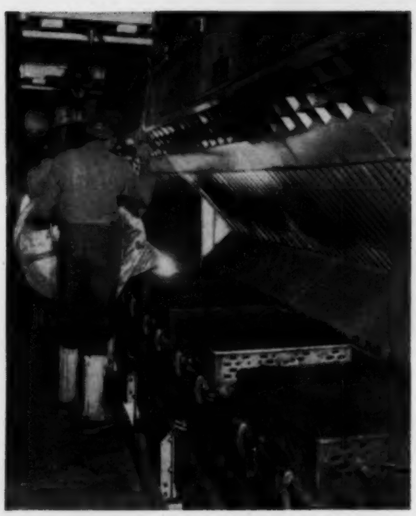
COMPANY ____________________

ADDRESS ____________________

CITY, ZONE, STATE ____________________



Now is the time to check WINTER WASTE of valuable warm air!



Cold weather can be costly. A check of your foundry's Building Ventilation Balance now, may show that heat is being wasted and the comfort of employees impaired.

A Schneible BVB Dust Control System can reduce heat loss from your building by as much as 75%.

Compensating Air Uni-flo Ventilation Hoods minimize exhaust of needed building heat because each unit balances its own air intake and exhaust. These Schneible Hoods offer scientifically controlled air patterns that prevent unnecessary suction of surrounding warm air.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Check that heat loss now—check with Schneible engineers for complete control of dust, fumes and Building Ventilation Balance. Write for literature on BVB.

SCHNEIBLE

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P. O. Box 81, North End Station
Detroit 2, Michigan

CABLE ADDRESS: CBSCO
EUROPEAN LICENSEE: ELEX S. A., ZURICH, SWITZERLAND

Core Drying Time CUT 91%

Core measures 10 inches in diameter, 3 inches high, 2 inches thick at base.

OLD TIME—70 minutes *in conventional oven*

NOW—6 minutes *in dielectric dryer*

Fast drying is a big story, but it is **not** the whole story! When this core comes out of the dryer, it is cool, dry, and ready to go right to the molder. This means cores can be made only as they're needed. In many foundries hundreds of square feet of valuable floor space can be converted from core storage to productive area, by changing to *Foundromatic* core dryers.

And in addition, they give you these benefits:

- Complete elimination of overbaking or burning of cores — even cores with thin sections.
- Good core finish.
- Easy shakeout.
- Fuel savings up to 60%.

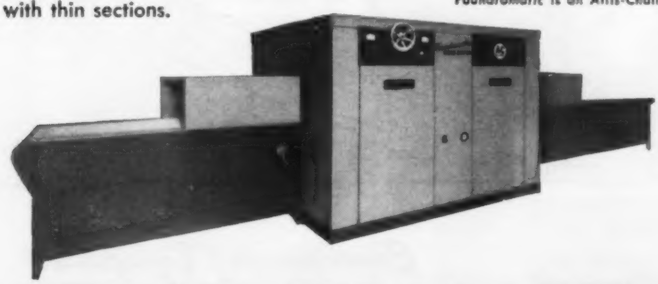
IMPROVED DESIGN

Now, new higher capacity, new compact design makes the latest *Foundromatic* core dryer a better investment than ever. Core drying capacity is increased as much as ⅓ (in the 25-kw size).

Call your nearby A-C district office for complete specifications. Or write Allis-Chalmers, Milwaukee 1, Wis.

Foundromatic is an Allis-Chalmers trademark.

A-4097



ALLIS-CHALMERS

FOUNDROMATIC SAND CORE DRYER

QUESTIONS and ANSWERS

About Dielectric Sand Core Drying

1. ***What dollar savings can I expect with the Foundromatic core dryer?***
Savings estimates of 55% to 70% have been reported.

2. ***Can metal dryers be used?***
Yes, metal dryers can now be used with no loss of production in specific applications.

3. ***Is auxiliary heat needed to cure cores on metal plates?***
No! By providing an insulating or non-metallic material between the core and the metal plate, cores may be cured without auxiliary heat.

4. ***How large a core can be dried?***
Cores that will pass through an aperture 36 inches wide and 13 inches high can be dried. One foundry is drying a core weighing 950 pounds in the *Foundromatic* dryer.

5. ***Fuel savings of 60% are mentioned. How is this possible?***
The dielectric heater delivers no power unless there is actually material between the electrodes. This means all the heat goes into the core. This makes for comfortable working conditions, too.

SEND

Allis-Chalmers
Milwaukee 1, Wisconsin

Please send me specifications on the improved *Foundromatic* sand core dryer.

Name

Title

Company

Street

City State A-4097

Products & Processes

Fill out postcard below for complete information on products listed in these pages.

Continued from page 12

CONVENIENT FORM FOR ORDERING INFORMATION

Crucible Furnace Lining

Two-piece lining for crucible furnaces consisting of two complete rings instead of customary circular half-sections saves installation labor. Lining is shipped assembled on pallet and ready to go into furnace. Can be checked by customer without unpacking. *Electro Refractories & Abrasives Corp.*

For more data, circle No. 107 on card

Conveyor Belt

XDC Conveyor Belt Cover extends belt life, especially under heavily abrasive conditions. Cover features resistance to abrasion, cutting, tearing, instead of tensile strength which company engineers say has been overemphasized. XDC Cover is being applied to wide range of supplier's belts. *Raybestos-Manhattan, Inc.*

For more data, circle No. 108 on card

Portable Air Heater

Standard Model Herman Nelson Portable Air Heater is self-contained, gasoline-fired unit supplying 100,000 to 385,000 BTU's per hour. Fuel metering valve permits saving fuel at lower, frequently desired capacities. Powered by small gasoline, unit is ideally suited where electricity is not available. *Portable Heater Sales, American Air Filter Co.*

For more data, circle No. 109 on card

Plastic Safety Lenses

Optilite A and Optilite B Plastic Safety Lenses meet federal specifications, fit standard industrial spectacle frames. Optilite A has extremely hard surface with high scratch resistance, weighs half as much as safety glass. Optilite B, extremely low in cost, is recommended for operations where short lens life is expected. *United States Safety Service Co.*

For more data, circle No. 110 on card

Hardness Tester

Penetrascope Multiple Angle Metal Hardness Tester requires no clamps, can be used in normally-inaccessible places, also as bench-type tester. Electromagnets hold unit firmly to any ferrous base. Can be used on small, thin material as well as large and odd-shaped items; gives accurate readings in range 16 to 800/1000 DPH. *C. Tennant, Sons & Co.*

For more data, circle No. 111 on card

Disc Sander

Two 7-in. disc sanders are designed for high speed under heavy load, can be used also with cup grinding wheels, cup wire brushes, flexible grinding discs, all parts of sander kit. Model 851 is for standard duty, Model 852 for heavy duty. Sanders operate at 4500 rpm, have front handle location said to take weight off user's hands and put it on work. Shorter length, lighter weight minimize worker fatigue. Motors are universal AC or DC, up to 60 cycles, 115 volts; 220 and odd voltages at no extra cost. *Skil Corp.*

For more data, circle No. 112 on card

Uplift Conveyor

Sheehan conveyors move loads 30 fpm or faster, require as little as 6-in. head room for metal belt at loading end, are unaffected by high temperatures. Spike-studded head pulley eliminates slippage. Available in stationary and adjustable models. *R. T. Sheehan Co.*

For more data, circle No. 113 on card

Reader Service Dept.

54|2

Please send me detailed information on the Products and Processes.

92	93	94	95	96	97
98	99	100	101	102	103
104	105	106	107	108	109
110	111	112	113	114	115
116	117	118	119	120	121
122	123	124	125	126	127
128	129	130	131	132	

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TITLE

COMPANY

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CITY AND ZONE

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Reader Service

AMERICAN FOUNDRYMAN

616 S. Michigan Avenue

Chicago 5, Illinois

Free Foundry Information

For additional information

use postcard at bottom of this page

Guide to Shell Molding

New 36-page booklet, "Durez Guide To Shell Molding," discusses in detail the method, materials and equipment used in shell molding. Also deals with many common problems encountered and suggests possible causes as well as solutions. Durez Plastics & Chemicals, Inc.

For more data circle No. 114 on card.

Apron Conveyors

Folder 2470 describes piano-hinged apron conveyors in three pan types, four chain pitches and four basic assemblies, designed to meet a wide variety of conveyor applications. Link-Belt Co.

For more data circle No. 115 on card.

Radiation Detectors

Bulletin TC-10 lists line of thermocouples, radiation detectors, and resistance bulbs. Also includes information on protection tubes, lead wire and other accessories for use with indicating, controlling and recording instruments. Wheelco Instruments Div., Barber-Colman Co.

For more data circle No. 116 on card.

Portable Hoists

Bulletin CL contains illustrations, descriptions and specifications for over 100 different types and sizes of portable hoists. Utility maintenance tools are also described. Coffing Hoist Co.

For more data circle No. 117 on card.

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Please send me detailed information on the Foundry Information circled.

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★ Please print or type information below

NAME

TITLE

COMPANY

ADDRESS

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Vibrolator

Booklet descibes construction and use of various types of the Peterson Vibrolator, items available for core box protection, and other foundry equipment available. Martin Engineering Co.

For more data circle No. 118 on card.

Automatic Lubrication

How to automatically lubricate entire conveyor lines — trolley wheels, chains, drives, carriers and rollers — without stopping the line, thus eliminating shutdowns for lubrication, work spoilage and hazards of lubrication is illustrated in catalog sheet 22-225 (Rev.) Alemite Div., Stewart-Warner Corp.

For more data circle No. 119 on card.

Dew Point Controller

Bulletin C-21 contains photographs and drawings of the instrument which automatically indicates, records and controls dew point in controlled atmosphere heat treating furnaces. Included is information on the operation of the new unit and data concerning its electronics principle. Ipsen Industries, Inc.

For more data circle No. 120 on card.

pH meters

Bulletin B-221 and B-225 describe use and advantages of pH meters. B-221 covers portable, rugged, compact one-dial electrometer. B-225 covers line-operated model for laboratory or shop. Coleman Instruments, Inc.

For more data circle No. 121 on card.

Suspensions and Gels

Bulletins 202, 206, 207 and 251 contain data on influence of pH and electrolytes on suspensions and gels of western and southern bentonite. American Colloid Co.

For more data circle No. 122 on card.

Mounted Wheels

Catalog 30 covers porcelain and resinoid bonded mounted wheels. Wheels are classified into "A," "B" and "W" shapes with the "A" and "B" grinding shapes illustrated full size. Catalog also contains illustrations and listings of abrasive cartridge and small grinding wheel mandrels and rubber polishing wheels. Metal Removal Co.

For more data circle No. 123 on card.

Conveying Equipment

Photos, specifications and application suggestions of portable and permanent-type belt units, gravity wheels and roller conveyors in steel and lightweight aluminum, and industrial casters and hand trucks, are included in catalog GC-53. Catalog also explains how conveying equipment can be used as separate units, or combined in a variety of ways to fit individual handling problems. Rapids-Standard Co.

For more data circle No. 124 on card.

continued on page 106

Letters to the Editor

All letters of broad interest which do not violate AFS policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

To Flux or Not to Flux

The article by R. H. Stone *"Use and Abuse of Crucibles,"* AMERICAN FOUNDRYMAN, September, 1953, pp. 57-61, is certainly a valuable contribution to the literature on this subject. We have an experimental foundry which is used substantially for development work on fluxes, exothermic compounds, etc., for improvement of techniques in the production of metal castings. Naturally, our consumption of crucibles is not heavy but nevertheless, Mr. Stone's article is of considerable value to ourselves.

However, we were a little mystified by his brief reference to the use of fluxes on page 60 of his article. He states that no flux is required for non-ferrous melting unless the charge is excessively dirty when he feels it is preferable to clean before melting. We feel that the mechanical cleaning of such a charge must be a very difficult process and not particularly acceptable to the average foundryman.

For many years, we have advocated the chemical cleaning of metals during the melting operation. This chemical treatment has become substantially standard practice in many countries and we feel that it has been developed to a comparatively fine art so that attack on crucibles is, if anything, minimized.

For example, if a copper-base alloy is melted without any surface cover under a reducing atmosphere, excessive quantities of hydrogen dissolve in the metal leading to considerable porosity in the resultant casting. The use of an oxidizing flux can completely prevent any hydrogen pick-up and also remove hydrogen from the metal which may have been introduced as a result of oil, etc., in the metal charge. The viscosity of these fluxes may be varied so that, under a variety of melting conditions, excessive attack on the crucible walls may be prevented.

Fluxes are of course also essential from many other points of view. The topic of melting losses has received considerable attention in the foundry literature within recent years. Typical figures of melting losses on non-flux treated copper melts are in the range 5—8 per cent; the judicious use of a flux can reduce this melting loss figure to figures of the order of 1 per cent, a very valuable saving to the foundryman.

This melting loss consists usually of either zinc loss by vaporization or of preferential oxidation of such constituents as tin and lead. It is perhaps of interest to point out the attack of these metallic oxides on the crucible may well be more severe than that of a correctly proportioned flux.

The advantage that may be obtained by the use of fluxes in the light alloy and other fields are, of course, well known to many foundrymen. It is sincerely hoped that these remarks will not be taken as criticism of Mr. Stone's most valuable paper but we did feel that his rather open remark on the use of fluxes could not pass without comment.

DR. D. V. ATTERTON
Research & Development Manager
Foundry Services, Inc.
Birmingham, England

Defends Stand on Flux

My thanks to Dr. Atterton for the kind things he says about the article. I appreciate this opportunity to offer the following comments.

There is plenty of authority for the statement in the article that no flux is required for non-ferrous melting unless to meet some special conditions such as dirty scrap used in the charge. Dr. Atterton says that cleaning of such a charge must be a very difficult process for the average foundryman. On this point *AFS Tentative Recommended Practices for Sand Cast Foundry Bronze, Red and Semi-Red Brasses* states:

"If the metal used is rather dirty or a large percentage of borings is used, a flux of a glass type will prove helpful in collecting the drosses. A mixture of 50 per cent glass and 50 per cent borax works quite well for this purpose. Care must be taken not to use a flux that will attack the crucible as this may result in the metal picking up undesirable impurities or materially reducing crucible life." There is no other reference in this paper to the use of fluxes.

Likewise, in *Tentative Recommended Practices for Sand Cast Copper Silicon Alloys,* it is stated: Fluxes are not necessary in some types of furnaces especially if good clean materials are used. However, a clean cover of glass or borax is a satisfactory precaution irrespective of type of melting unit used."

Again, *Tentative Recommended Practices for Sand Cast Tin Bronzes,* states that "fluxes are not particularly necessary especially when good clean materials are used. For metal melted in crucibles, glass is a good flux."

Dr. Atterton cites the example of a copper-base alloy melted under a reducing atmosphere under which conditions, in the absence of any surface covering, hydrogen is dissolved in the metal, resulting in porous castings. It would seem that the proper procedure in this case would be to correct the cause, i.e., operate the furnace with a slightly oxidizing atmosphere rather than to attempt to cure the condition produced by improper furnace operation.

There appears to be another very good reason for melting in crucibles without a cover unless some special conditions require it. This reason is that the benefit to be derived by operating the crucible furnace with a slight oxidizing atmosphere is to give ready access of this oxygen to the metal. It has been clearly demonstrated that lower quality melts result from melting under a glass cover while the metal melted with no cover except the dross formed as a result of the access to air produces higher quality metal. (See *"Understanding Melt Quality"* by J. G. Kura, AMERICAN FOUNDRYMAN, August 1953, and Fourth Annual AFS Foundation Lecture, Publication No. 46-1.)

Incidentally, other investigators noting the phenomenon of lowered melt quality as a result of an impervious glass cover on top of the metal came to the absurd conclusion that the lower quality was a result of gases passing through the crucible wall failing to deduce the true cause, namely the cover prevented the oxygen from performing its function of purification.

Perhaps a distinction should be made in the use of the word *flux* which is loosely used to designate both the cover type of flux and those fluxes which play a real chemical part in shaping up the melt ready for pouring. Phosphor copper as well as the gaseous and solid fluxes used in aluminum melting would come under the second classification of flux given above and, as Dr. Atterton points out, have their essential uses. Provision for such applications of fluxes is allowed for in my article in the sentence beginning "if flux is required, etc."

RICHARD H. STONE, Sls. Mgr.
Vesuvius Crucible Co.
Swissvale, Pittsburgh, Pa.

Always Glad to Help

This is to appreciate your assistance granted to us while we were travelling your country. We arrived safely back at Heneda Air Port on November 9, fully achieving our original purposes. Honestly, we think that we were more successful than we had anticipated. Although the trips were our first experience abroad, it was simply your unusual kindness and hospitality that made our trips such fruitful.

Since we came back to Japan we are awfully busy to recover our absence. Would you kindly excuse that we did not write you as soon as we arrived here. We are determined to make the most of the various precious experiences we had during our observation trips of this time in the future improvement of our local casting industry.

Convinced that you and your business will ever be more prosperous, we remain,

JIRO INAGAWA, *President*
Futaba Iron Foundry Co., Ltd.
Kawaguchi City, Japan

SPEED *Prevents* WASTE

AJAX-NORTHRUP INDUCTION FURNACES

Ajax-Northrup Induction Furnaces melt so fast there's no time for "burning-up" chromium, molybdenum, master alloys, and other easily oxidized materials.

One foundry, melting stainless steel, recovers 99% of the chromium charged . . . saves $60,000 a year in reduced losses of this single element.

A typical non-ferrous foundry reduced melting costs by over $33.00 a ton!

If you've got a tough melting problem where speed, accurate control, and low losses of expensive metals are important, we'd like to show you what induction melting can do for you. Just write or call us.

STEEL MELTING

NON-FERROUS MELTING

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AJAX NORTHRUP

INDUCTION HEATING AND MELTING

Since 1916

AJAX ELECTROTHERMIC CORPORATION Trenton 5, New Jersey

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AJAX ELECTRIC FURNACE CORPORATION
AJAX ELECTRIC COMPANY, INC.
AJAX ENGINEERING CORPORATION

is setting records for lining life in high-frequency induction furnaces

INDIANA
Using Taylor Zircon grog-type ramming mix, an operator of two, 300-lb. Ajax-Northrup furnaces consistently obtains 100 heats melting nickel-chrome alloy or stainless steel. Magnesia linings averaged 20-25 heats.

SOUTH CAROLINA
Foundry superintendent writes his Taylor Zircon lining cost 0.0005 *cents per pound* after tapping 100th heat—116,650 lbs. total—of cast iron from 1000-lb. Ajax-Northrup furnace. Anticipates getting 200,000 lbs. total melt before relining. Formerly averaged 35-50 heats.

NEW YORK
Steel company obtained 324 heats from Taylor Zircon lining in 700-lb. Ajax-Northrup furnace melting stainless and a wide variety of alloy steels. A new record for this foundry!

These performance reports are being duplicated by many foundries across the nation. Linings of Taylor Zircon Ramming Mix are outperforming linings rammed of magnesia, magnesia-alumina spinel and/or sillimanite or mullite in Ajax-Northrup, Allis-Chalmers and other types of high-frequency induction furnaces melting nickel, stainless steel and similar high nickel-chrome alloys. CAUTION—Taylor Zircon linings are *not* recommended when a large percent of dirty scrap or appreciable amounts of iron oxide are present in the melt.

Write us for recommendations on your melting requirements.

Exclusive Agents in Canada:
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.
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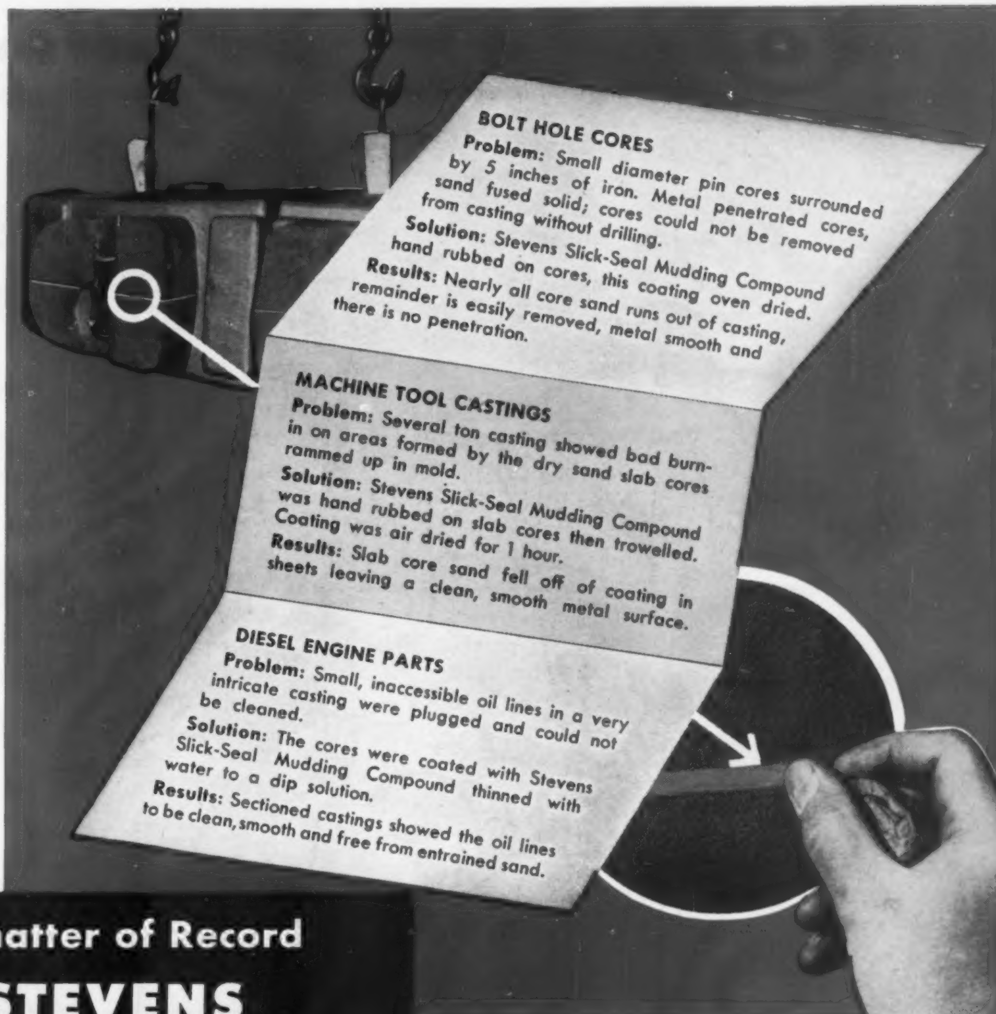

It's a matter of Record

STEVENS MUDDING COMPOUND . . .

provides a smooth solution to rough core problems

When your core problem is a puzzler, such as one of those shown from our records above, you may well be amazed at the easy solution offered by Stevens Slick-Seal Mudding Compound.

Slick-Seal never crumbles, rolls or balls up. Core workers like the way it washes off the hands easily with just plain water. Although quick drying when applied, Slick-Seal remains plastic and workable throughout an 8-hour shift. Edges never shrink or curl when subject to oven heat . . . flowing metal can't dislodge it. Slick-Seal completely prevents fins or burn-in at pasted joints.

To improve your casting finish, request Stevens Technical Bulletin F-110 from your Stevens Sales Engineer or order a supply and try Stevens Slick-Seal Mudding Compound today. If a light-colored compound is preferred, order Stevens White Mudding Compound. FREDERIC B. STEVENS, INC., Detroit 16, Michigan.

FREDERIC B. STEVENS INCORPORATED

EVERYTHING FOR A FOUNDRY

BRANCHES: BUFFALO • CLEVELAND • INDIANAPOLIS NEW HAVEN • DAYTON
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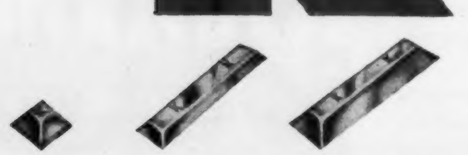
SITUATION UNDER CONTROL BY KEOKUK

KEOKUK ELECTRO-METAL COMPANY
KEOKUK, IOWA
WENATCHEE DIVISION, WENATCHEE, WASHINGTON

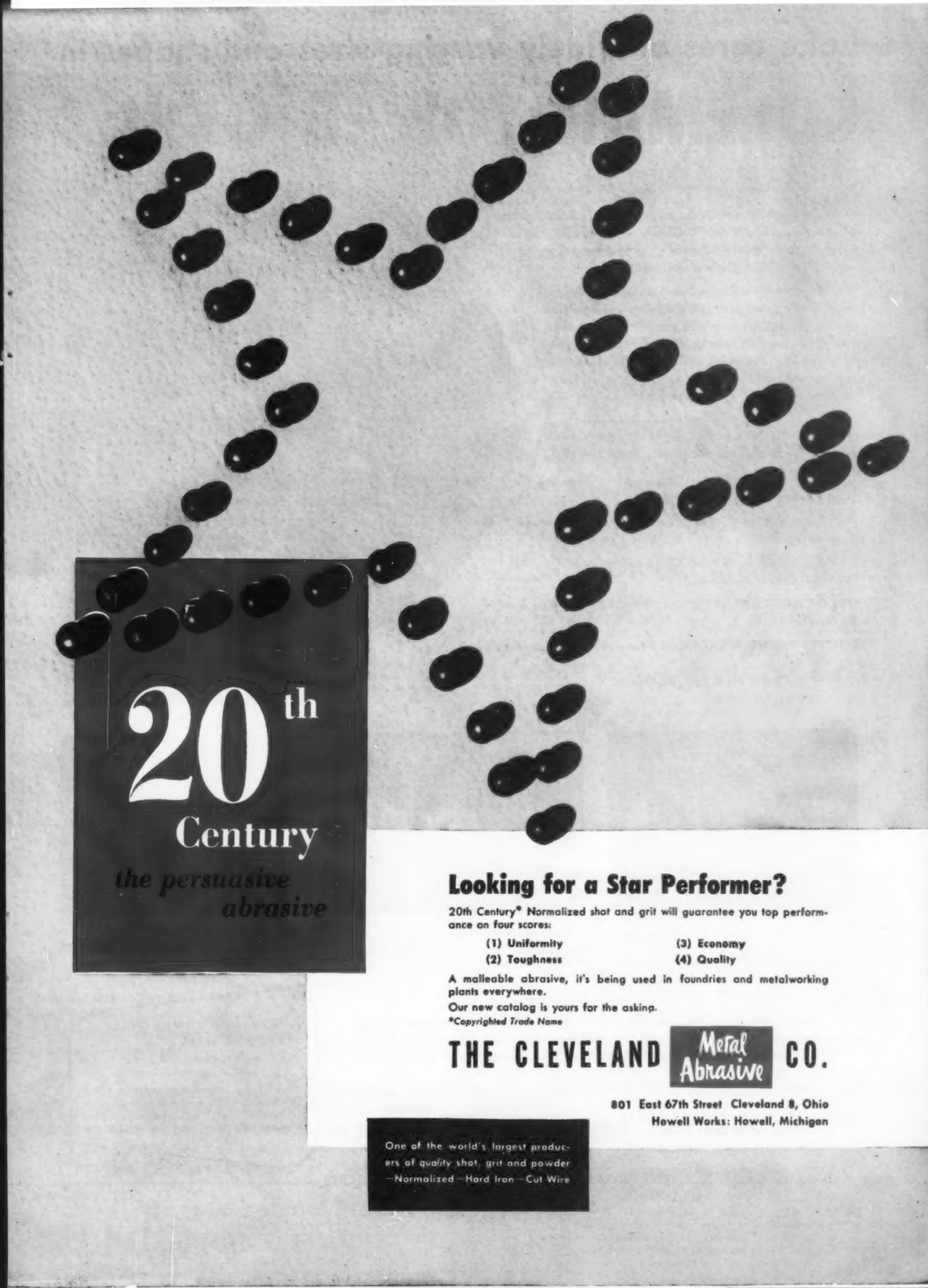


Keokuk Silvery . . . the superior form of silicon introduction for steel plants and foundries . . . available in 60 and 30 lb. pigs and 12½ lb. piglets . . . in regular or alloy analysis. Keokuk also manufactures high silicon metal.

Control both quality and costs with Keokuk Silvery Pig Iron! *Being a less concentrated form of silicon, Keokuk holds silicon loss to a minimum.*
Car for car, pig for pig, its uniformity *never* varies.
Charge *Keokuk* by magnet or count!

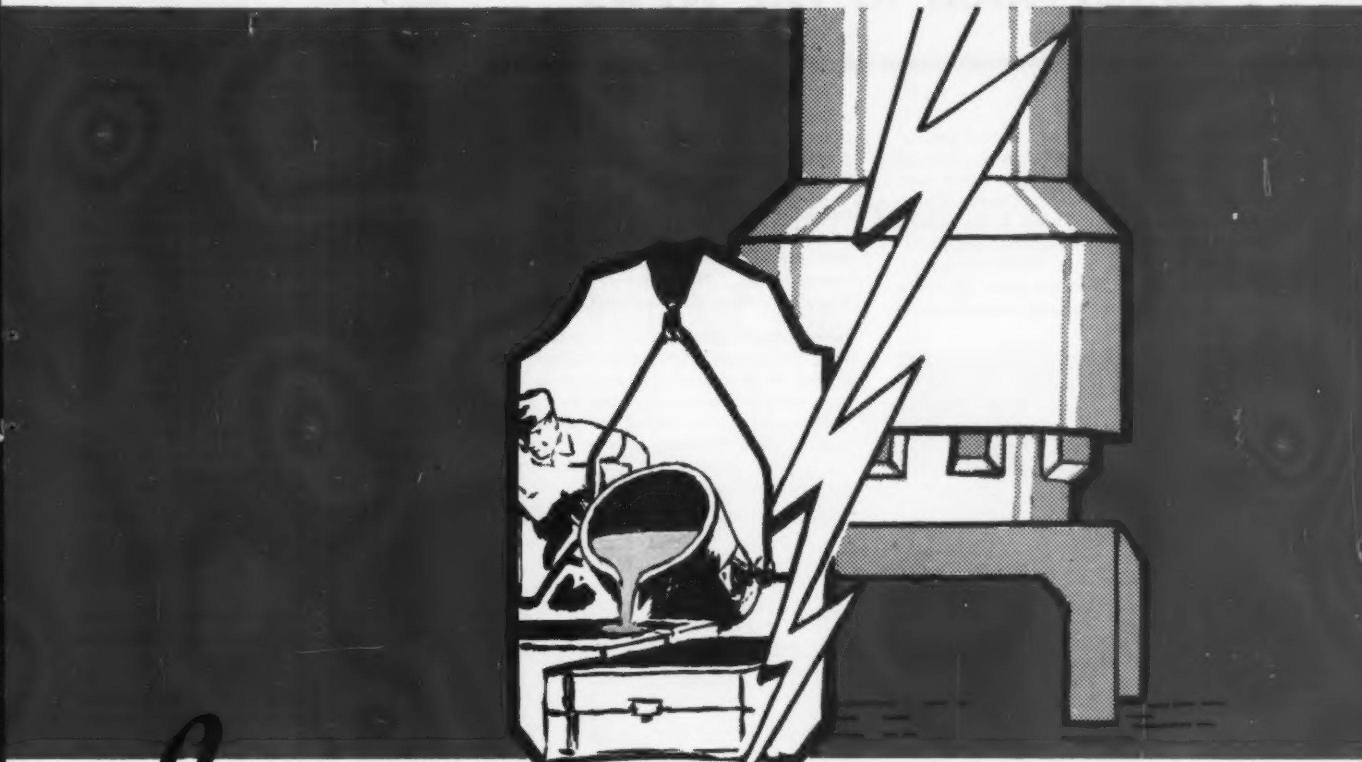
SALES AGENT: MILLER AND COMPANY

332 S. Michigan Ave., Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio
407 N. Eighth St., St. Louis 1, Missouri



WHY MANY FOUNDRIES PRODUCE A BETTER GRADE OF CASTINGS

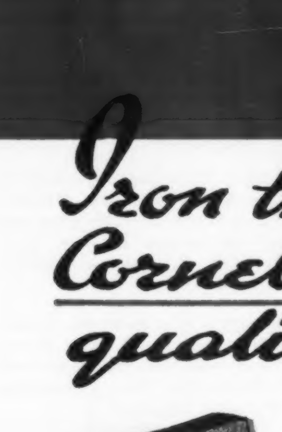
WHY MANY FOUNDRIES PRODUCE A BETTER GRADE OF CASTINGS



Iron that is cleansed by Famous Cornell Cupola Flux is of better quality and more "lively."

Molten iron which contains impurities and is not right in fluidity is responsible for a very large percentage of casting rejects and scrap loss.

Famous Cornell Cupola Flux conditions iron so that the castings you pour will be stronger, cleaner and easier to machine. Sulphur, in many cases, will be reduced to practically nothing.



pre-measured
SCORED BRICK FORM
(Approx. 4 lb. brick)

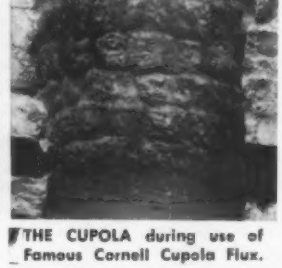
Famous Cornell Cupola Flux takes but a few seconds to use, enables greater accuracy in fluxing molten iron, and prevents waste.

Another Advantage:
CLEANER CUPOLAS.

Very little time is required for digging out as drops are cleaner and there is practically no bridging over. Patching is reduced, due to a glazed or vitrified protective surface which is formed on brick or stone.

WRITE FOR BULLETIN NO. 46-B

THE CUPOLA before using Famous Cornell Cupola Flux.



THE CUPOLA during use of Famous Cornell Cupola Flux.

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

Foundrymen in the News

Bernard N. Ames has been named general manager of the Doran Manganese Bronze Co., Brooklyn, N. Y., wholly owned subsidiary of the Columbian Bronze Corp., Freeport, L. I. He was head of the casting development and foundry-practices section of the New York Naval Shipyard, Brooklyn, N. Y., for the past 13 years. Mr. Ames has served as consultant to

B. N. Ames . . . To Doran

numerous ferrous and non-ferrous foundries; is a member of many technical organizations and currently chairman of the Brass & Bronze Div. of AFS, as well as chairman of the Metropolitan Chapters, AFS. He has authored many technical papers and articles, among them the 1953 official exchange paper on "Shell Molding" from AFS to the Institute of British Foundrymen.

Grant H. Arrasmith has joined the engineering staff of the Brake Shoe & Castings Div., American Brake Shoe Co. at Mahwah, N. J.

The following changes have occurred at Griffin Wheel Co., a subsidiary of American Steel Foundries, Chicago: **Edmund Q. Sylvester,** has been elected president, he was formerly vice-president: **Herbert J. Rosen,** formerly president, chairman of the executive committee; **John W. Birttingham,** formerly vice-president-treasurer, first vice-president, and **Cedric P. Voll** is now treasurer-controller.

Edward L. Bohn has been named vice-president of Mullite Refractories Co., Shelton, Conn. He has been with the firm a year, prior to that he was with Charles Taylor Sons Co., Cincinnati, Ohio.

Otto V. Guenther has been appointed president of the Troy Technical Institute. Prior to his appointment he was head of the mechanical and metallurgical technology department of the Erie County Technical Institute, Buffalo, N. Y.

Frank M. Hunter has been appointed service engineer and **Bart C. Dickey,** process development engineer in the production department, of Acheson Colloids Co., Port Huron, Mich.

Robert H. Scheel has been appointed sales engineer for the Hydro-Blast Corp. He will represent the firm in New York, Pennsylvania, New Jersey, Delaware, Maryland, New England and Ontario.

Juho Tuomikoski, formerly metallurgist with Valmet Oy, Jyväskylä, Finland, producers of gray iron and malleable castings, took a busman's holiday by visiting Chicago foundries during the Christmas season. He is studying foundry engineering and metallurgy on a scholarship at Cornell University.

James E. Fifield has been named vice-president and general manager of the newly re-organized Ductile Iron Foundry, Inc., Stratford, Conn. He was formerly with the New England Technical Field

J. E. Fifield . . . Vice-President

Section of International Nickel Co. **Henry D. Phillips,** president of Hartford Electric Steel Co., will also serve as president of Ductile and **Walter P. Jacob** is chairman of the board of both concerns.

Morehead Patterson, chairman of the board and president of American Machine & Foundry Co., was re-elected board member of the National Industrial Conference Board in New York recently.

Jack M. Esten has been appointed abrasive engineer and **Robert C. Divoll,** field engineer, for the Norton Co., Worcester, Mass.

Carl Meinhard, formerly a metallurgist in the research department of the Rheinische Roehrenwerke A.G., Dusseldorf, Germany, has joined the staff of the director of research at Lindberg Steel Treating Co. **Muhammad Abdur Rashid** has joined the metallurgical staff of the Melrose Park, Ill. plant of Lindberg.

Vern Lorch has been appointed technical specialist in the pig and ingot product office of Kaiser Aluminum & Chemical Sales, Chicago.

John F. Schnur, foundry technologist, Armour Research Foundation, Illinois Institute of Technology, recently returned to the United States after 20 months in India, where he demonstrated modern foundry techniques. He will return to India to establish a training center for foundrymen at the Indian Institute of Technology in Kharagpur.

Harold E. Collins has been elected vice-president in charge of marketing operations for the Pigments and Abrasives Divisions, Metals Disintegrating Co., Elizabeth, N. J. He was formerly sales manager of the Pigments Div.

Dr. Charles J. Kentler, Jr., has been named technical consultant, Meter & Valve Div., Rockwell Mfg. Co., Pittsburgh, Pa.

Harold O. Washburn has been elected chairman of the board of American Hoist & Derrick Co., St. Paul, Minn.

Charles M. Offenhauer has been named assistant manager, Metals Research Laboratories, Electro Metallurgical Co., Niagara Falls, N. Y.

Fred R. Bayne has been promoted to chief engineer at Alten Foundry & Machine Works.

A. I. Hurd, formerly advertising manager of National Engineering Co., Chicago, has joined the firm of Russell T. Gray, Inc., advertising agency.

Kazuo Kaneko, chief engineer, Nagoya plant of Kobe Steel Works, Ltd., Nagoya, Japan, recently visited shell molding and die casting installations in New York City, Buffalo, N. Y., Chicago, Detroit, Cleveland and Cincinnati, Ohio.

R. G. Pence and **J. W. Cleveland,** operating as Rajac Equipment Sales Corp., have been appointed sales representatives by the Whirl-Air-Flow Div., Gerwin Industries, Michigan City, Ind.

William B. Greene has been appointed personnel manager of the Union Steel Castings Div., Blaw-Knox Co. Since 1949

W. B. Greene . . . Personnel Manager

he has been the division safety supervisor, which duties will be included in his new position.

HERE'S HOW...

LINDBERG-FISHER TILTING FURNACES DOUBLE PRODUCTION....

with half as many furnaces – at 39% lower fuel cost!

See your Lindberg-Fisher man for full details, or write for Bulletin No. 57-A.

Hammond Brass Works, Hammond, Indiana, manufacturers of fine bronze, valves and fittings, recently installed 6 Lindberg-Fisher constant-arc nose pouring, gas fired, tilting furnaces for their melting and pouring operations. They have operated these furnaces for more than 6 months, 8 hours a day, 5 days a week. Their experiences show greatly increased production, reduced production costs, with safer and cleaner operating conditions.

Hammond Brass Works reports that small, obsolete furnaces were replaced with half as many large, modern Lindberg-Fisher mechanized tilting furnaces. The number of necessary heats per day was reduced one-third while double the quantity of molten metal was handled. Fuel consumption per lb. of metal was reduced 39%, labor cost per operation was lowered and crucible life increased from 65-70 heats to an average of 95-100 and up to 200 heats per crucible. Clean-up time has been reduced and maintenance problems simplified—resulting in a safer, cleaner operation, and raised employee morale.

Fisher Furnaces

A DIVISION OF LINDBERG ENGINEERING CO.

2440 West Hubbard Street, Chicago 12, Illinois

Manufacturer Challenges Foundry . . .

■ Wanted: A way to mold or cast cores of motors or transformers instead of having to make them of stacked sheets of metal.

This is one of the needs expressed in a recent announcement by the General Electric Co. The company has other needs but this fits the foundry industry like shellac fits a pattern. In this desire for a better method lies confirmation of belief in the slogan "A Casting Is the Shortest Distance Between Raw Material and Finished Product," and a challenge to the foundry industry.

One can only guess now at the marvels of metallurgy and molding that must be combined to satisfy this electrical manufacturer's requirements. Metallurgical problems involved should not be insurmountable since many alloys now being used in electrical applications either can be or are being cast. Nevertheless, they're not easily solved on a production basis since the magnetically soft materials desired for transformer and motor manufacture must be low in carbon, sulphur, nitrogen, and oxygen. These elements in very small amounts (carbon under 0.01 per cent, preferably under 0.005 per cent, for example) have a great effect on magnetic efficiency.

Pure iron would be an ideal material but is ruled out because resistivity is low, requiring the present practice of building up thin laminations to reduce eddy currents. It is fortunate from a castability standpoint that aluminum and silicon increase resistivity and are therefor added (usually silicon) in amounts as high as 4.5 to 6 per cent. Silicon and aluminum also make possible high-temperature annealing without recrystallization during cooling. Result is the large grain size that is desired.

One stickler for foundry metallurgists will be the production of castings with a definite grain orientation. This is desirable because grains of iron-silicon alloys are not equally susceptible to magnetizing in all directions. Producers of rolled sheet now supply this material with definite grain orientation.

The advent of new molding methods combined with almost simultaneous improvement in traditional techniques should leave no doubt in the minds of foundrymen or their customers as to the ability of the foundry industry to produce electrically-useful alloys to shape.

Here, clearly, is an opportunity to find a short cut to manufacturing by developing a method of casting motor and transformer cores. Traditionally, the foundryman has been singularly adept at finding ways to make the impossible job. Here is a typical problem which the castings industry may some day solve through improved technology and foundry know-how, plus acceptance of a competitive challenge.

Herbert F. Scobie

HERBERT F. SCOBIE
Technical Editor

At maximum capacity, the plant produces 540 wheels per day, requiring approximately 215 tons of melt. Finished wheels are carried in loads of six to this outside storage area by fork-lift truck. Storing wheels edgewise permits pick-up by fork truck when they are to be shipped.

Fork-Lift Truck Systems Speed Wheel Production

L. W. Bennett / *Storage Battery Div., Thomas A. Edison, Inc., West Orange, N. J.*
S. Davis / *Hays Plant Supt., Southern Wheel Div., American Brake Shoe Co., Pittsburgh, Pa.*

L. W. Bennett

S. Davis

■ The first step in modernizing the Pittsburgh (Hays) Pennsylvania plant of the Southern Wheel Div., American Brake Shoe Co., was the adoption of power trucking (two 4000-lb fork trucks) in 1945 to replace manual handling of chilled-tread, cast-iron car wheels (the plant's sole product) together with, foundry supplies and scrap. Modernization of the foundry was completed in 1949 when a new, completely mechanized molding, shake out and sand-reclaim system was put in operation during which time the trucks assisted in moving the heavy equipment into position.

The foundry has a daily production capacity of 540 wheels requiring the movement of approximately 220 tons of raw material and supplies (exclusive of molding sand) and of slightly less than an equivalent tonnage of finished wheels. The two trucks handle this volume of material, plus scrap and baked cores, in the course of a normal 8-hour work day.

Start of Operations

Handling operations incidental to production start at an outdoor scrap-wheel storage area where worn-out wheels are picked up by the fork-lift trucks and carried unskidded six at a time, to a breaker which reduces them to cupola-sized pieces for re-melting. As shown by accompanying illustrations, the only special equipment required for handling the wheels by fork truck is a "hoe"-shaped attachment which assists in picking up and stabilizing the load. The load is further stabilized by notches (corresponding to the flanges of the wheels) on the inner edges of the forks. When the trucks are employed for handling pallet and skid loads, the attachment is quickly removed and inserted

in brackets on the battery compartments where it is always accessible.

A second industrial-trucking route extends from the receiving dock to an enclosed storage area and thence to the core-making department and the molding line. Supplies, principally of bagged bentonite, seacoal, mold-facing compounds and cupola brick, are assembled in unit loads on 48 x 48-in. double-faced wooden pallets inside the cars where they are picked up by the fork-lift trucks and carried to storage. This method of handling replaces manual trucking and has the additional advantage of permitting the material to be tiered three loads high in storage with an increase of 100 per cent in the use of available space. At the same time, the supplies are more readily accessible and stock control is improved.

With exception of molding sand, all foundry supplies, such as this bagged bonding compound, are palletized on receipt and carried to storage by one of two fork-lift trucks. To left is 20 per cent grade, which trucks negotiate en route to the receiving platform.

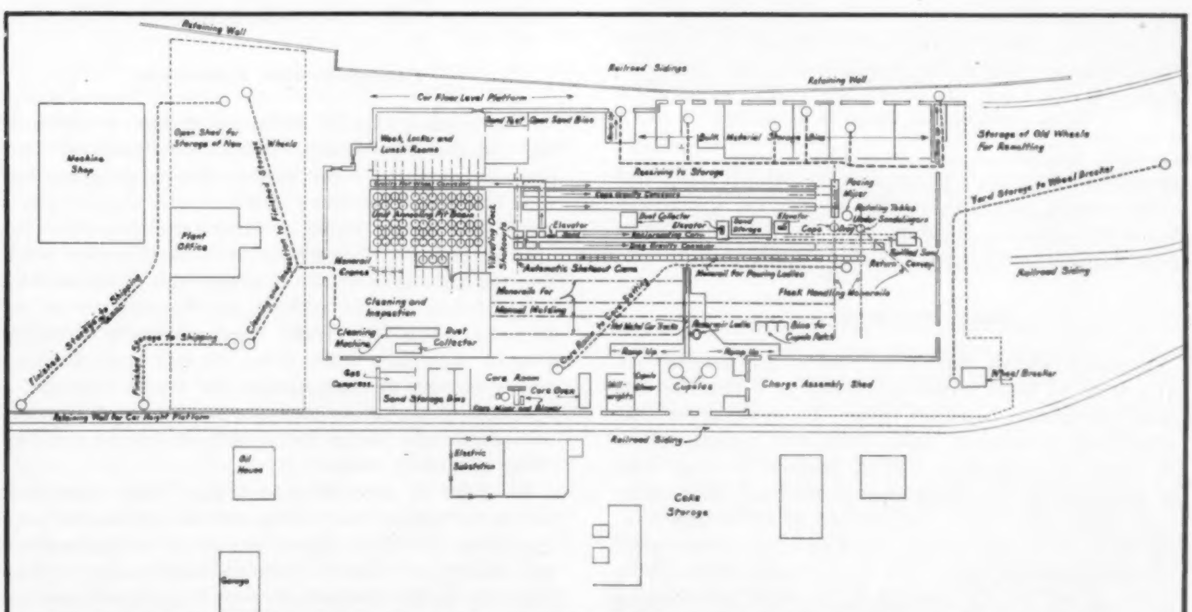
Cores in Skid Boxes

Bagged material is carried in full pallet loads to the core-making department from which a third truck route extends to the core-setting station on the molding line. Baked cores are carefully accumulated in shallow skid boxes which are carried to point of use by the fork-lift trucks. These boxes are purposely made shallow to provide easy access for the molders who set the cores.

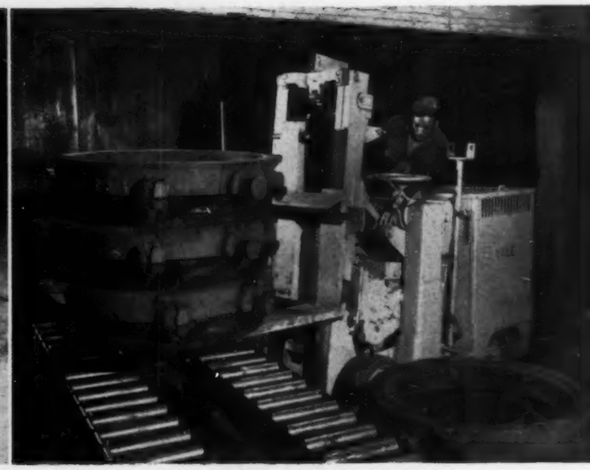
Scrap is of two types: reclaimable and disposable. The first consists of the 70-lb heads or gates of excess metal which are knocked off the hubs of the wheels at shake-out and chuted to skid bins spotted beneath. Filled bins are picked up by fork-lift truck and carried to the charge make-up area where the heads are added to the charges for remelting.

Disposable scrap consists of screenings from the sand-reclamation system. This is likewise chuted from the shake-out mechanism to skid bins spotted beneath. When filled, these bins which are of rocker-dump type,

Before adoption of power trucking, six trips would have been required for the wheel rollers to deliver this load of scrap wheels to the breaker. Note "hoe" attachment for holding the wheels on the forks, and V-shaped buffer plate which inclines the wheels away from the truck when the load is set down.



Floor plan of Hays Plant. Fork-lift truck routes and terminals are indicated by heavy broken lines and circles.



While the industrial fork-lift trucks used at the Hays Plant are employed primarily to carry old wheels from the point of yard storage to the start of production, and new wheels from the terminus of production to the shipping area, they have also proved invaluable in servicing the many requirements of the operating production lines. Trucks carry pallet boxes of cores (left) from the core-making department to the core-setting station on the molding line. Damaged or worn flasks (right) are transported from the molding line to the machine shop where they are either repaired and serviced for continued use, or scrapped. Trucks are adaptable to many operations in the foundry.

Relatively small but important phase of production consists of these "special" wheels, which are cast on a pouring floor separate from the main mechanized casting operation. Following shake-out, the wheels are picked up by truck from wheel stands, taken to inspection.

are carried to a yard storage area by fork-lift truck and subsequently elevated, as illustrated, to a highway truck for disposal. Manual handling has been completely eliminated from this operation.

Easier Handling

Finished wheels, like scrap wheels, are handled six at a time by truck rather than one at a time, as was done previously, by wheel rollers. From shake-out, the wheels are lowered by power hoist into annealing pits in which they undergo a 72-hr gradual cooling. This is followed by finishing operations and inspection, after which the wheels are carried to an outside storage area. Here, they are set down on edge in rows until scheduled for shipping. The trucks follow through by carrying the wheels directly from stock to shipping platform as needed.

One of the greatest contributions which power trucking has made to the over-all efficiency of the plant is in the elimination of the hazardous, menial wheel-rolling operation. During periods of peak production, as many as five men formerly spent the greater part of their time rolling worn-out wheels from scrap pile to start of production and another five rolling new wheels from finishing to storage to shipping. Fork trucks were purchased to handle this work before mechanization of molding and were responsible for man-hour reduction even before this mechanization took place. The modernization generally has accomplished a reduction of one man-hour per wheel, and the use of fork trucks accounted for an important part of this saving. Workmen formerly employed as wheel rollers were released for more productive work.

Company-wide Experience

The applications of industrial power trucking to the handling operations heretofore described were planned as part of the modernization program and were based on experience obtained with electric power trucking at other plants of American Brake Shoe Co.

In common with many other users of power trucking, the management of the Pittsburgh plant soon developed uses for the fork-lift trucks which were not foreseen when the trucks were originally installed. One of these uses arises from the fact that, during a power outage, the batteries in the trucks continue as a source of power so that the trucks can be pressed into extremely useful emergency service in the handling of molten metal.

In order to provide a controlled time interval in which the temperature of the melt is lowered for pouring (from 2600 F at cupola to desired temperatures at the molds), it is drawn from the cupola into a 10-ton reservoir ladle, from which it is transferred into two or more pouring ladles. The pouring ladles are alternately carried on a transfer car underneath the reser-

voir ladle then out to within reach of a hoist which brings them up over the pouring line.

In case of an interruption in the plant's power supply, the hoist becomes inoperative and the pouring line stops. If the interruption is of more than an hour's duration, it is necessary to shut off the cupola and pour the melt out of the reservoir ladle before it can set and permanently put the ladle out of commission. For this purpose, the trucks take the place of the hoist. This is accomplished by means of yoke attachments which fit over the forks and which are designed to engage the trunnions of the pouring ladles. The trucks then lift the ladles, pour any molds that had been assembled at the time of the outage, and dispose of the melt remaining in the reservoir ladle. It is carried to any available area on the foundry floor where a sand dike is hastily thrown up within which it can be dumped to be salvaged later. Were it not for this expedient, the only place in which the 10 tons of metal could be dumped would be the depressed pit in which the transfer car operates, thus putting the car out of operation for the two or three days required for the melt to cool and be removed.

In Case of Shakeout Failure

Another emergency application of the industrial trucks lies in keeping production going during a mechanical failure of the complex electric-eye actuated shake-out mechanism at the end of the molding line.

This mechanism receives the molds from the conveyorized pouring line, opens them, shakes out the hot castings, knocks off the heads and elevates the rough castings to a point within reach of the crane which serves the annealing pits. These operations are performed mechanically in a period of two minutes and cannot exceed three minutes without allowing the castings to cool below the critical temperature at which they must be placed in annealing.

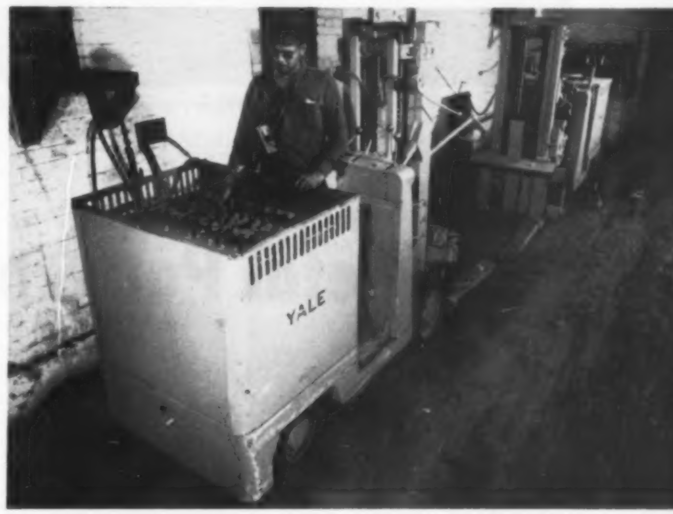
So that the castings which have been poured will not be ruined in the event of a mechanical failure of the complex shake-out mechanism, the trucks are employed to by-pass the mechanical shake-out by carrying the molds to a temporary, manual shake-out station and thence to the crane serving the annealing pits, until repairs have been completed.

Despite the work load handled by the two trucks and the fact that trucks and batteries are subjected to extremes of temperature ranging from over 100 F in the foundry in the summer months to as low as 0 F when working outside in the winter months, they require little attention and no special care.

Truck Maintenance

At the end of each day's work, the trucks are parked in an out-of-way area in the foundry where the routine operations of charging and watering the batteries are performed by the truck operators. These consist of removing battery-compartment covers to expedite cooling, checking solution level and adding distilled water when needed, determining the amount of charge required by taking test-fork readings, connecting charging leads, and putting the batteries on charge.

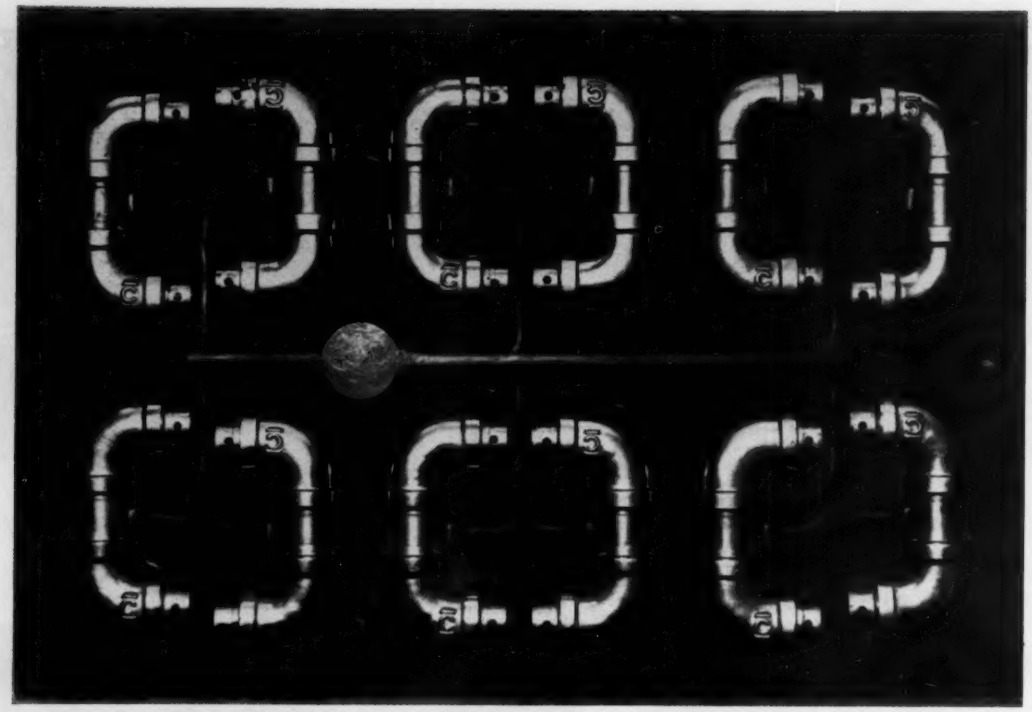
Scrap, consisting mostly of screenings collected from sand-reclaim line, is accumulated in rocker-dump-skid bins, emptied directly into dump trucks for disposal, with power trucking replacing manual wheelbarrows.



The 30-cell nickel-iron-alkaline storage batteries with which the trucks are powered are charged in this out-of-the-way area, to which the trucks are brought at the end of the work day. Charging leads, extending through the wall from a rectifier, terminate in polarized quick connectors. After test reading, time switches are set, and water added. Charge is automatically terminated.

Charging current is obtained from a two-circuit rectifier located in the millwright's shop from which charging leads extend through the wall to the truck parking area. Time switches on the rectifier terminate the charge automatically. Distilled water, obtained from the plant's laboratory, is added to the batteries by means of an electric filling outfit. Periodically, the batteries are steam-cleaned by the millwrights who use a portable steam "jenny" assigned to their department.

Proper maintenance and handling of the truck power units has served to materially lengthen the useful life of individual batteries. Such practices are necessary for maximum efficiency throughout the system.



Patterns for ½-in. elbows made by shell molding to minimize hand finishing

Cast Metal Patterns in Shell Molds

CLARENCE R. DUTTON / *Supt. of Foundries, Crane Ltd., Montreal, Que.*

C. R. Dutton

■ Crane Ltd. became interested in the shell mold process, not primarily for quantity production, but for the making of metal patterns. These patterns for small machine molding are numerous and are constantly being increased in number as well as being renewed due to wear.

Previous practice in making of small patterns for mounting on plates was to pour cast iron or bronze in green sand molds. The resulting castings required a considerable amount of machine and hand finishing before mounting. Patterns produced by the shell mold process require almost no hand finishing before mounting on plates. Result is an average net saving of about 30 per cent of the overall cost of producing pattern plates.

Shell-molded patterns, while made in the author's plant mostly in cast iron to stand up for long production runs, can be made with equal accuracy and smoothness in white metal, aluminum, or brass for mounting on metal match plates, or in plaster or stone.

Shell-Mold Pattern Procedure

Steps in making shell-mold patterns are as follows:

1. A half master pattern is made in wood conforming to the general shape of the desired pattern with finish allowance all over and *triple* contraction allowance.
2. From this master, two green sand castings are made. These are faced at the parting line, dowelled together, turned, milled and finished by hand to true dimensions plus *double* contraction.
3. The half patterns are then mounted on a steel plate, gated, and sufficient half molds are made by the shell process to provide the number of patterns needed for the final pattern plate.
4. The castings from the shell molds, which have

Turn-over box for making shells has quick acting lock to hold pattern plate in place.

now *single* contraction allowance are surface-ground on the parting, polished with emery cloth and mounted without further finishing requirement.

Equipment needed is simple. The two essential units are:

1. Some sort of turnover box with suitable clamping arrangement to contain the sand-plastic mixture and to allow dumping the mixture onto and off the pattern.
2. An oven capable of being heated to 500-700 F.

Thorough Mix Necessary

The sand-plastic mixture is made with clay-free sand of 120-150 AFS Grain Fineness to which is added 6 per cent by weight of powdered thermosetting plastic. The sand must be perfectly dry and the plastic thoroughly mixed with it. The whole must be free from lumps or balls.

A liquid silicone spray parting, made up or ready to use, is used for easy release of the cured shells.

Steps in making the shells are:

1. Heat the pattern plate in oven to about 600 F.
2. Spray with silicone parting.
3. Clamp pattern face down on turnover box containing sand mixture.
4. Reverse box for 10-20 seconds or time enough to produce a 3/16-in. thick shell.
5. Remove plate with shell and place in oven with shell upwards. Cure for 2-5 minutes at 500-700 F.
6. Remove from oven, immediately stand plate on edge and tap gently with hammer on back of plate to loosen shell.

Eliminates Ejector Pins

It has not been found necessary to make elaborate plate assemblies incorporating ejector pins for freeing the shell from the plate since adaptation of this process to pattern making is not designed primarily for speed of repetition. It is, however, worthy of note that it is quite practical to operate the process without ejector pin assemblies especially where relatively small plates and uncomplicated casting design are concerned. With a reasonably smooth plate and pattern and proper use of silicone parting, a few gentle taps with a hammer will detach the shell quite readily.

The mold so produced may be used immediately or stored indefinitely. Assembly and pouring of the molds clamped and backed with steel shot follows the practice which has been frequently described in the foundry literature.

Prompt Entry Urged for 1954 AFS Apprentice Contest

As the 1954 AFS Convention approaches, more Society Chapters than ever before are sponsoring local apprentice contests. For the first time, Twin City Chapter is conducting a contest. Other participating Chapters are: Birmingham, Detroit, Eastern Canada, Metropolitan, Michiana, Northeastern Ohio, Northern Illinois-Southern Wisconsin, St. Louis, Northern California, Southern California, and Wisconsin.

A large number of organizations in the foundry field are also conducting local plant contests this year.

The 1954 AFS Apprentice Contest closes March 12. National Judging will take place at the Cleveland Trade School, 535 Eagle Ave., Cleveland, on April 2. Prize winning entries in local contests should be shipped to that address for the judging, marked for the attention of Mr. F. C. Cech, *shipping charges prepaid*.

Cost Questions Answered

Questions on specific foundry cost problems will be answered at a Cost Session of the 58th Annual Meeting of AFS in Cleveland, May 8-14. Foundrymen seeking practical answers by the experts on the Cost Committee are invited to send their questions promptly to: Ralph L. Lee, Chairman, AFS Foundry Cost Committee, % Grede Foundries, Inc., Box 443, Milwaukee. The 1954 question-and-answer session on foundry costs is expected to be one of the most interesting and informative staged by the committee in view of rising interest in cost accounting stimulated by current business conditions. Also creating problems are some of the newer production methods and equipment which introduce cost factors that previously did not exist.

Partial List of Exhibitors at Cleveland Convention

ITH the 58th Annual Convention and Foundry Exhibit just three months away, this 1954 AFS showcase of foundry industry equipment and roundup of the most advanced technical thinking is fast developing into one of the most comprehensive shows in the long history of the event.

The program of technical sessions, shop courses, round table luncheons, and dinners is being pushed to finality. Progress reports from various division committees are printed on page 70 of this issue. Subjects of papers and questions for panel discussions are being chosen from every phase of operations within the purview of the metals casting industry. Inquiries for housing applications received at National Headquarters indicate a large attendance at Cleveland.

The industry has responded enthusiastically to the Foundry Exhibit that will be staged conjointly with the Convention in Cleveland's spacious Public Auditorium. Applications for exhibit space that had been received as of January 1, 1954, portend one of the best of this internationally important series of shows.

The partial list of exhibitors is as follows:

Acme Resin Corp.	Forest Park, Ill.
Adams Co.	Dubuque, Iowa
Aerodyne Development Corp.	Cleveland
A. I. C. Engineering Co.	Indianapolis
Air Reduction Sales Co.	New York
Ajax Electric Furnace Corp.	Trenton, N. J.
Ajax Electrothermic Corp.	Trenton, N. J.
Ajax Flexible Coupling Co., Inc.	Westfield, N. Y.
Allis-Chalmers Mfg. Co.	Milwaukee
Alloy Metal Abrasive Co.	Ann Arbor, Mich.
Alpha-Lux Co., Inc.	New York
American Air Filter Co., Inc.	Louisville, Ky.
American Colloid Co.	Chicago
American Fire Clay & Prods. Co.	Canfield, Ohio
AMERICAN FOUNDRYMAN	Chicago
American Gas Association	New York
American Lava Corp.	Chattanooga, Tenn.
American Metal Market Co.	New York
American Refractories & Crucible Corp.	North Haven, Conn.
American Silica Sand Co., Inc.	Ottawa, Ill.
American Tank & Fabricating Co.	Cleveland
American Wheelabrator & Eqpt. Corp.	Mishawaka, Ind.
Apex Smelting Co.	Chicago
Archer-Daniels-Midland Co.	Cleveland
Arrow Pattern & Engineering Co.	Erie, Pa.
Ayers Mineral Co.	Zanesville, Ohio
Bakelite Co., Div. of Union Carbide & Carbon Corp.	New York
Baker-Lull Corp.	Minneapolis
Baroid Sales Div., National Lead Co.	Chicago
Barrett Div., Allied Chemical & Dye Corp.	Toledo, Ohio
C. O. Bartlett & Snow Co.	Cleveland
Bay State Abrasive Prods. Co.	Westboro, Mass.
Beardsley & Piper Div., Pettibone Mulliken Corp.	Chicago
Bedford Tool & Forge Co.	Bedford, Ohio
Black, Sivalls & Bryson, Inc.	Kansas City, Mo.
Blastcrete Service Co.	Los Angeles
Blaw-Knox Co.	Pittsburgh, Pa.
Borden Co., Chemical Div.	New York
Branford Co.	New Haven, Conn.

British Moulding Machine Co., Ltd.	Faversham, Kent, England
Brush Beryllium Co.	Cleveland
Buckeye Prods. Co.	Cincinnati
Buda Co.	Harvey, Ill.
Burr Oak Brass & Aluminum Div., Keyes-Davis Co.	Burr Oak, Mich.
Cambell-Hausfeld Co.	Harrison, Ohio
Canton Chaplet & Mfg. Co.	Canton, Ohio
Carborundum Co.	Niagara Falls, N. Y.
Carl-Mayer Corp.	Cleveland
Centrifugal Casting Machine Co.	Tulsa, Okla.
Chain-Belt Co.	Milwaukee
Chicago Blower Corp.	Franklin Park, Ill.
Chicago Pneumatic Tool Co.	New York
Clark Eqpt. Co.	Battle Creek, Mich.
Clearfield Machine Co.	Clearfield, Pa.
Cleco Div., Reed Roller Bit Co.	Houston, Texas
Cleveland Flux Co.	Cleveland
Cleveland Metal Abrasive Co.	Cleveland
Cleveland Vibrator Co.	Cleveland
Climax Molybdenum Co.	New York
Colonial Metals Co.	Columbia, Pa.
Corn Products Sales Co.	New York
Davenport Machine & Foundry Co.	Davenport, Iowa
Dayton Oil Co.	Dayton, Ohio
Dayton Pneumatic Tool Co.	Dayton, Ohio
Debevoise-Anderson Co., Inc.	New York
Delhi Foundry Sand Co.	Cincinnati
Delta Oil Products Co.	Milwaukee
Wm. Demmler & Bros.	Kewanee, Ill.
Detroit Electric Furnace Div., Kuhlman Elec. Co.	Bay City, Mich.
Harry W. Dietert Co.	Detroit
Dings Magnetic Separator Co.	Milwaukee
Joseph Dixon Crucible Co.	Jersey City, N. J.
DoALL Co.	Des Plaines, Ill.
Dougherty Lumber Co.	Cleveland
Dow Corning Corp.	Midland, Mich.
Dravo Corp.	Pittsburgh, Pa.
Durez Plastics & Chemicals, Inc.	No. Tonawanda, N. Y.
Eastern Clay Prods., Div. International Minerals & Chemical Corp.	Chicago
Eastman Kodak Co.	Rochester, N. Y.
Eder Instrument Co.	Chicago
EIMCO Corp.	Chicago
Electro Metallurgical Co., Div. Union Carbide and Carbon Corp.	New York
Electro Refractories & Abrasives Corp.	Buffalo, N. Y.
Exomet, Inc.	Conneaut, Ohio
Fabreeka Products Co.	Boston
Fanner Manufacturing Co.	Cleveland
Federal Foundry Supply Co.	Cleveland
Federated Metals Div., American Smelting & Refining Co.	New York
FOUNDRY	Cleveland
Foundry Educational Foundation	Cleveland
Foundry Equipment Co.	Cleveland
Foundry Equipment Manufacturers Assoc.	Cleveland
Foundry Facings Manufacturers Assn.	Pittsburgh, Pa.
Foundry Services, Inc.	New York
Fox Grinders, Inc.	Pittsburgh, Pa.
Freeman Supply Co.	Toledo, Ohio
Fremont Flask Co.	Fremont, Ohio
General Electric Co., Chemical Div.	Pittsfield, Mass.
Gerwin Industries, Inc.	Michigan City, Ind.
Girdler Co.	Louisville, Ky.
Claud S. Gordon Co.	Chicago
Gray Iron Founders' Society, Inc.	Cleveland
Great Lakes Carbon Corp.	St. Louis
Great Lakes Foundry Sand Co.	Detroit
Great Western Mfg. Co.	Leavenworth, Kans.
Samuel Greenfield Co., Inc.	Buffalo, N. Y.
Grindle Corp.	Markham, Ill.
Harbison-Walker Refractories Co.	Pittsburgh, Pa.
Hardy Sand Co.	Evansville, Ind.
Harnischfeger Corp.	Milwaukee
Benjamin Harris & Co.	Chicago Heights, Ill.
Harrison Abrasives Div., Metals Disintegrating Co.	Elizabeth, N. Y.
Haylco Controls Corp.	Milwaukee
Hercules Powder Co.	Wilmington, Del.
Herman Pneumatic Machine Co.	Pittsburgh, Pa.
Hewitt-Robins, Inc.	Stamford, Conn.
Hickman, Williams & Co.	Cleveland
Hill & Griffith Co.	Cincinnati
Hines Flask Co.	Cleveland
Hoffman Foundry Supply	Cleveland
Frank G. Hough Co.	Libertyville, Ill.
E. F. Houghton & Co.	Philadelphia
Hutchinson Foundry Products	Alton, Ill.
Hydro-Blast Corp.	Chicago
Hydroway Scales, Inc.	Detroit
Illinois Clay Prod. Co.	Chicago
Induction Heating Corp.	Brooklyn, N. Y.
Industrial & Foundry Sales, Inc.	Eaton Rapids, Mich.
Industrial X-Ray, Inc.	West Hempstead, N. Y.
Ingersoll-Rand Co.	New York
International Graphite & Electrode Div. Speer Carbon Co.	St. Marys, Pa.
International Molding Machine Co.	LaGrange Park, Ill.
International Nickel Co., Inc.	New York
Iron Lung Ventilator Co.	Cleveland
Ironton Fire Brick Co.	Ironton, Ohio
Jaeger Machine Co.	Columbus, Ohio
Jeffrey Manufacturing Co.	Columbus, Ohio
Kindt-Collins Co.	Cleveland
Andrew King	Ardmore, Pa.
Lester B. Knight & Associates, Inc.	Chicago
H. Kramer & Co.	Chicago
Chas. A. Krause Milling Co.	Milwaukee
Kwik-Mix Co.	Milwaukee

Cleveland, host city for the 1954 AFS Convention and Exhibit, presents striking panorama in aerial photo.

Laboratory Eqpt. Corp.	St. Joseph, Mich.
Laclede-Christy Co.	St. Louis
Lava Crucible-Refractories Co.	Pittsburgh, Pa.
R. Lavin & Sons, Inc.	Chicago
Lindberg Engineering Co.	Chicago
Linde Air Products Co., Div. Of U. C. C. C.	New York
Link-Belt Co.	Chicago
Machine Products Corp.	Detroit
Macklin Co.	Jackson, Mich.
Magie Bros., Inc.	Chicago
Magnaflux Corp.	Chicago
Manhattan Rubber Div., Raybestos-Manhattan, Inc.	Passaic, N. J.
Manley Sand Co.	Rockton, Ill.
Manning, Maxwell & Moore, Inc.	Muskegon, Mich.
Martin Engineering Co.	Kewanee, Ill.
Martindale Electric Co.	Cleveland
Master Pneumatic Tool Co., Inc.	Bedford, Ohio
J. S. McCormick Co.	Pittsburgh, Pa.
Meehanite Metal Corp.	New Rochelle, N. Y.
Merit Corp.	Milwaukee
Metal Blast, Inc.	Cleveland
Metallizing Company of America	Chicago
Michigan Smelting & Refining Div. of Bohn Aluminum & Brass Corp.	Detroit
Mine Safety Appliances Co.	Pittsburgh, Pa.
Modern Equipment Co.	Port Washington, Wis.
Monsanto Chemical Co.	St. Louis
The Moulders' Friend	Dallas City, Ill.
Nassau Smelting & Refining Co., Inc.	Staten Island, N. Y.
National Carbon Co., Div. of U. C. C. C.	New York
National Crucible Co.	Philadelphia
National Engineering Co.	Chicago
Newaygo Engineering Co.	Newaygo, Mich.
New Jersey Silica Sand Co.	Millville, N. J.
Niagara Falls Smelting & Refining Div. Continental Copper & Steel Ind., Inc.	Buffalo, N. Y.
Wm. H. Nicholls Co., Inc.	Richmond Hill, N. Y.
Nichols Engineering & Research Corp.	New York
Non-Ferrous Founders' Society	Chicago
North American Smelting Co.	Wilmington, Del.
Norton Co.	Worcester, Mass.
S. Obermayer Co.	Chicago
Ohio Crankshaft Co., Tocco Div.	Cleveland
Ohio Ferro Alloys Corp.	Canton, Ohio
Oliver Machinery Co.	Grand Rapids, Mich.
Orefraction, Inc.	Pittsburgh, Pa.
Osborn Manufacturing Co.	Cleveland
Pangborn Corp.	Hagerstown, Md.
Pekay Machine & Engineering Co.	Chicago
Peninsular Grinding Wheel Co.	Detroit
Penn-Rillton Co.	New York
Pennsylvania Glass Sand Corp.	Pittsburgh, Pa.
Penola Oil Co.	Detroit
Penton Publishing Co.	Cleveland
George F. Pettinos, Inc.	Philadelphia
Pittsburgh Crushed Steel Co. & Subsidiaries	Pittsburgh, Pa.
Pittsburgh Lectromelt Furnace Corp.	Pittsburgh, Pa.
PMS Co.	Cleveland
Precision Grinding Wheel Co., Inc.	Philadelphia
Production Experts, Inc.	Cleveland
Pyrometer Instrument Co., Inc.	Bergenfield, N. J.
Ready-Power Co.	Detroit
Redford Iron & Eqpt. Co.	White Plains, N. Y.
Reichold Chemicals, Inc.	Cleveland
Reynolds Metals, Inc.	Louisville, Ky.
River Smelting & Refining Co.	Cleveland
H. H. Robertson Co.	Pittsburgh, Pa.
Robinson Clay Prods. Co.	Akron, Ohio
Roessing Bronze Co.	Pittsburgh, Pa.
Ross Operating Valve Co.	Detroit
Ross-Tacony Crucible Co.	Philadelphia
Rotor Tool Co.	Cleveland
Royer Foundry & Machine Co.	Kingston, Pa.
Safety Clothing & Equipment Co.	Cleveland
Sand Products Corp.	Cleveland
Sawyer Bailey Corp.	Buffalo, N. Y.
Claude B. Schneible Co.	Detroit
A. Schrader's Son, Div. of Scovill Mfg. Co.	Brooklyn, N. Y.
Schramm, Inc.	West Chester, Pa.
I. Schumann & Co.	Cleveland
Scientific Cast Prods. Corp.	Cleveland
Severance Tool Industries, Inc.	Saginaw, Mich.
Shalco Engineering Corp.	Connellsville, Pa.
Shallway Corp.	Connellsville, Pa.
Shell-O-Matic, Inc.	Irvington, N. J.
Simonds Abrasive Co.	Philadelphia
Simplicity Engineering Co.	Durand, Mich.
Sipi Metals Corp.	Chicago
Smith Oil & Refining Co.	Rockford, Ill.
Smith & Richardson Mfg. Co.	Geneva, Ill.
Solvay Process Div., Allied Chemical & Dye Corp.	New York
Southern Shell Mold Eqpt. Co.	Chattanooga, Tenn.
Specialty Prods. Co.	Jersey City, N. J.
Spencer Turbine Co.	Hartford, Conn.
SPO, Inc.	Cleveland
Springfield Pattern Works, Inc.	Springfield, Mass.
Standard Electrical Tool Co.	Cincinnati
Standard Horse Nail Corp.	New Brighton, Pa.
States Engineering Corp.	Ft. Wayne, Ind.
STEEL	Cleveland
Steel Founders' Society of America	Cleveland
Sterling Abrasives Div., Cleveland Quarries Co.	Tiffin, Ohio
Sterling Wheelbarrow Co.	Milwaukee
Frederic B. Stevens, Inc.	Detroit
Stroman Furnace & Eng. Co., Div. Petersen Oven Co.	Irvington, N. J.
Sutter Prods. Co.	Dearborn, Mich.
Tabor Mfg. Co.	Philadelphia
Taggart Brimfield Co.	Hammonton, N. J.
G. H. Tennant Co.	Minneapolis
Thiem Prods., Inc.	Milwaukee
Titanium Alloy Mfg. Div., National Lead Co.	New York
Toledo Scale Co.	Toledo, Ohio
Tractomotive Corp.	Deerfield, Ill.
Tyler Metal Prods. Co.	St. Louis
Union Carbide & Carbon Corp.	New York
United Oil Manufacturing Co.	Erie, Pa.
United States Gypsum Co.	Chicago
United States Hoffman Machinery Corp.	New York
United States Reduction Co.	East Chicago, Ind.
United States Rubber Co., Mechanical Goods Div.	New York
Vanadium Corp. of America	New York
Vesuvius Crucible Co.	Pittsburgh, Pa.
Vibron Div., Burgess-Sterbentz Corp.	Cleveland
Westover Engineers	Milwaukee
Whitehead Brothers Co.	New York
White Pine Lumber Co.	Chicago
Whiting Corp.	Harvey, Ill.
Williston and Co.	Delta, Ohio

Round Table Questions – Brass and Bronze Division

THE Round Table Luncheon of the Brass and Bronze Division, to be held at noon, Tuesday, May 11, 1954, at the AFS Convention in Cleveland, will again feature a question period. In order to facilitate the discussions, the questions are listed here in advance:

1. Why don't test bars cut from castings have the same properties as those obtained from separately cast test bars?

2. What is the effect of chemical variation within a casting on the mechanical properties?
   a. What is the cause of this variation?
   b. Are all copper-base alloys similarly affected?
      (1) Red brasses (low shrink)
      (2) Al-Mn bronzes (high shrink)

3. What effect does cooling rate have on segregation and mechanical and physical properties?

4. If metal is gassed due to a heavy slag cover while melting and this cover is removed on subsequent heats and high quality metal is then obtained, will excessive shrinkage result in this latter metal?
   a. How do you determine the quality of the metal?

5. What problems are encountered in melting and casting the high tensile bronzes?
   a. Aluminum bronzes
   b. Manganese bronzes
   c. Silicon brasses

6. What merits are to be obtained when superheating copper-base alloys?

7. What fundamental facts about combustion should the foundryman know to achieve high quality metal?

8. Does the melting crucible enter into the gas reaction in the metal?

9. What are the economics involved in the casting of copper-base alloys in the following:
   a. "D" Process
   b. "C" Process
   c. High pressure molding

10. What beneficial or detrimental effects do the minor elements have on the copper-base casting alloys?
    a. Sulphur
    b. Aluminum
    c. Hydrogen
    d. Carbon
    e. Sodium
    f. Potassium
    g. Silicon

11. Why aren't synthetic sands used more extensively than natural bonded sand in the molding for brass and bronze alloys?

N. E. Ohio Chapter Releases Convention Committee Lists

NORTHEASTERN Ohio Chapter, host for the 1954 AFS Convention and Foundry Exhibit, has released its committee rosters for this 58th annual meeting.

S. E. Kelly

Honorary Chairman for the event is AFS past President, W. L. Seelbach, of Superior Foundry, Inc., Cleveland. Chairman will be S. E. Kelly, Eberhard Mfg. Co., Cleveland, who is also Chairman of the host chapter.

Other officers of the General Convention Committee include: *Secretary:* H. E. Heyl, Federal Foundry Supply Co., Cleveland; and *Treasurer:* F. R. Fleig, Smith Facing & Supply Co., Cleveland.

Three other members of this committee have been appointed: H. R. Strater, North American Refractories Co., Cleveland; W. E. Sicha, Aluminum Co. of America, Cleveland; and H. J. Trenkamp, Ohio Foundry Co., Cleveland.

Committee Officers

Officers of other committees are listed as follows:

Reception Committee. *Chairman:* H. C. Gollmar, Elyria Foundry Div., Industrial Brownhoist Co., Elyria, Ohio. *Vice-Chairman:* W. E. Sicha, Aluminum Co. of America, Cleveland.

Ladies' Entertainment Committee. *Chairman:* Mrs. S. E. Kelly. *Vice-Chairman:* Mrs. David Clark, Jr.

Banquet Committee. *Chairman:* A. D. Barczak, Superior Foundry, Inc., Cleveland. *Vice-Chairman:* G. J. Nock, Nock Fire Brick Co., Cleveland.

Northeastern Ohio Day Committee. *Chairman:* John Davenport, Fulton Foundry & Machine Co., Inc., Cleveland. *Vice-Chairman:* R. A. Green, Eastern Clay Prods. Co., Cleveland.

Publicity Committee. *Chairman:* Harold Wheeler, Superior Foundry, Inc., Cleveland. *Vice-Chairman:* R. H. Herrmann, Penton Publishing Co., Cleveland.

Plant Visitation Committee. *Chairman:* W. L. Woody, National Malleable & Steel Castings Co., Cleveland; *Vice-Chairmen:* E. M. Knapp, Ferro Machine & Foundry Inc., Cleveland; and A. C. Denison, Fulton Foundry & Machine Co., Cleveland. *Executive Secretary:* E. J. Romans, National Malleable & Steel Castings Co. *Technical Advisor:* L. T. Crosby, Sterling Wheelbarrow Co., Cleveland.

Shop Course Committee. *Chairman:* F. C. Cech, Cleveland Trade School, Cleveland. *Vice-Chairman:* J. G. Goldie, Cleveland Trade School, Cleveland.

Foundry Prepares Own Refractory For Lining and Patching Cupolas

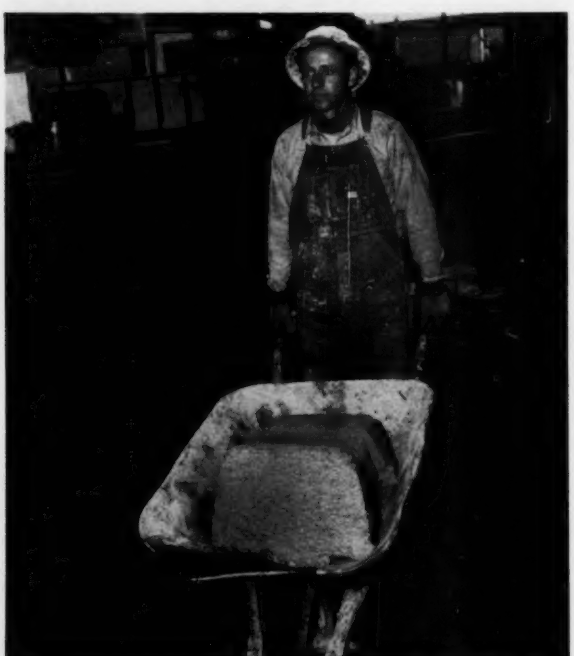
HERBERT F. SCOBIE / *Technical Editor*

■ Cupola operation at Golden Foundry Co., Columbus, Ind., is essentially standard except for the refractory practice developed by Melting Superintendent Sam Hodler. The practice is based on a mixture that is used not only for daily patching but also for lining the cupola. The material is more economical than previous linings used and it gives better metal control due to reduced burn out.

Two cupolas lined to a 60-in. diameter melting zone are used, each operating seven to eight hours a day on alternate days. Producing a base iron designed to give 2 per cent silicon after a 0.3 per cent addition of crushed ferrosilicon, the cupola in use normally supplies 14 tons of metal per hour of the following composition: carbon, 3.20-3.30 per cent; silicon, 1.90-2.10; manganese, 0.7-0.8; sulphur, 0.15 max.; and phosphorus, 0.10 max.

The ¾-¼-in. ferrosilicon is continuously added at the spout near the tap hole by means of a vibrating feeder. Spout temperature of the metal is 2800-2850 F. During a heat, metal runs continuously from the front slagging spout. Slag is carried away in a stream of water.

Carbon is controlled by varying the proportions of



Slabs of refractory mix are cut to desired thickness to replace burned-out cupola linings.

Melting superintendent Sam Hodler looks on as refractory is tamped into box day before intended use.

Squares of refractory are fitted and rammed into place, imparting a dense structure to the entire patch.

Ramming seals cracks, making entire patch monolithic.

steel and scrap and composition is checked by the laboratory which phones carbon, silicon, and manganese results to the melting department every half hour. All motor blocks and cylinder heads are dated and numbered by ladle so composition and mechanical properties of the metal can be checked at any future time. A sizable proportion of the castings produced by Golden is for diesel engines.

A wedge-shaped chill test poured in a core is cast from every transfer ladle after filling from the forehearth. Almost every ladle of base iron is altered through additions of more ferrosilicon or various combinations of copper, molybdenum, vanadium, chromium, and nickel. While being filled from the 8000-lb forehearth, transfer ladles are suspended from a weighing section of the monorail system. The man controlling tilting of the forehearth keeps one eye on the ladle, the other on the scale so that accurate weights of metal are dispensed for alloying.

Charges Made by Electromagnet

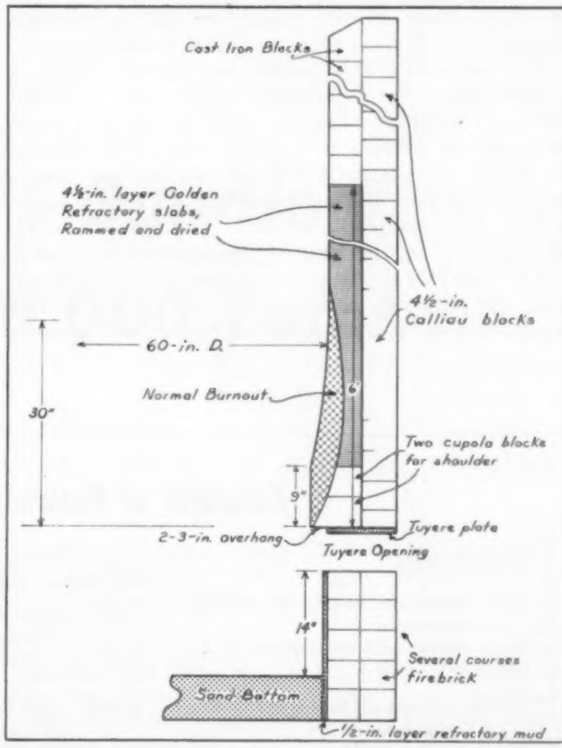
Metal charges weigh 2700 lb and consist of 600 lb malleable pig, 100 lb silvery pig, 900 lb No. 1 steel scrap, and 1100 lb returns. Charges are made up by electromagnet to just under the desired weight of each component. Prescribed weight of each component is made up manually by a man on the charge makeup platform. As he trims the charges, he pushes a button to record on tape the exact weight of each component.

A coke charge consists of 300 lb of 5 x 8-in. by-product coke and the amount is never varied unless coke quality changes. The bed, built up to 72 in. above the tuyere plates, is laid on 1-in. boards. First a layer of large lumps of coke is laid with a channel being left open along a diameter of the cupola. The channel leads to a square opening in the shell and lining large enough to permit insertion of a torch for lighting up. The channel is covered with large lumps of coke, and another layer of 1-in. wood is put on before building the bed to its nominal height. Bed height is checked with a measuring rod.

The bed is lit with a fuel-oil torch for one hour, then burned in by natural draft for 2 hours, and finally brought up to 72 in. before any metal is added. Before putting the blast on, the port for the torch is sealed with the refractory mix to be described and closed with a steel plate.

Flux used in the cupolas is 1-in. limestone, 100 lb

Smoothing up the patch with circular trowel, as seen from the cupola charging door.

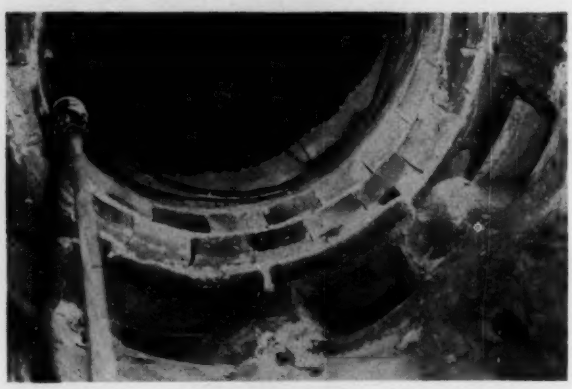


Section of cupola lining, showing combination of manufactured and plant-prepared refractory used.

being included in the bed and 60 plus 8 lb of 1-in. fluorspar being added by hand to the center of each charge after it has been dropped into the cupola from the cone-bottom charging buckets.

Blast under air-weight control usually is supplied at the rate of 5400 cfm; windbox pressure is 9-10 oz/sq in. Blast volume may be altered during a heat if necessary to adjust the iron supply to pouring demand. On days when a higher or lower than normal demand prevails, blast volume is set accordingly.

Preparation for patching a cupola starts the day before when the lining material is made up. The mixture used consists of 4 parts by volume of a Pennsylvania mica schist and 1 part by volume of an Ohio



Ring-shaped torch at edge of patch dries refractory.

fireclay. Size and distribution of the aggregate are as important as the material used, and best results are obtained with 60 per cent of the mica schist on the ¼-in. screen with the balance through ¼ in. down to fines. The fireclay passes a $\frac{1}{16}$-in. screen.

The refractory and binder are mixed dry in a paddle mixer for 3 minutes. Then water is added gradually until the mixture balls up. At this point the moisture content is 9-11 per cent. After mixing, the plastic mass is packed by air rammer into metal-lined boxes with inside dimensions of 11 in. x 12 in. x 6 ft. The refractory mixture develops additional plasticity during the next 24 hours before it is used.

The next day the boxes are turned over and drawn from the refractory which is now ready for use. The cupola having been chipped out, squares of refractory of the desired thickness are cut off like huge pats of butter. The squares are fitted into place and rammed home with an air rammer having a 5-in. diameter butt-off head. After the lining has been brought out to normal contour, it is moistened slightly and finished with a 6-in. diameter circular trowel.

Special Mixture

In the well zone, a ½-in. layer of a special mixture (3 parts by volume of fireclay, 7 parts by volume of mica schist, 12-15 per cent water) is maintained over the cupola block. The same mixture, which is easier to work by hand than the material made up in slabs, is used for minor hand patching and for lining ladles.

The fresh patching is dried for a minimum of an hour by means of a ring-shaped gas torch. This is simply a piece of pipe bent to fit inside the cupola and drilled to give a number of small flames. The patching job is completed by applying a slurry of proprietary refractory to fill shrinkage cracks. Residual heat in the lining dries the slurry.

For the bottom, a half and half mixture of "green" and "dry" sand is used. The green sand is a natural Tennessee molding sand. Dry sand is the same sand containing residual pitch compound from a facing mixture.

The cupola lining consists primarily of Golden refractory mix backed up by firebrick in the well zone and calliau blocks the rest of the way up to near the charging door. Hollow blocks of cast iron are used in the zone where impact of charged metal must be absorbed.

Calendar of Future Meetings and Exhibits

February

1-5 . . American Society for Testing Materials
Hotel Shoreham, Washington, D. C. Committee Week.

11-12 . . Wisconsin Regional Foundry Conference
Schroeder Hotel, Milwaukee.

18-19 . . Southeastern Regional Foundry Conference
Patten Hotel, Chattanooga, Tenn.

March

4-5 . . American Society for Metals
Hotel Statler, Boston, Mass. Mid-Winter Meeting.

10-11 . . Foundry Educational Foundation
Hotel Cleveland, Cleveland. College-Industry Conference.

15-19 . . National Association Corrosion Engineers
Kansas City Municipal Auditorium. 10th Annual Conference.

16-17 . . Steel Founders' Society of America
Edgewater Beach Hotel, Chicago. Annual Meeting.

19-20 . . East Coast Regional Foundry Conference
Philadelphia, Pa.

April

5-7 . . American Institute of Mining & Metallurgical Engineers
Palmer House, Chicago. National Open Hearth Conference.

8-9 . . Malleable Founders' Society
Pittsburgh, Pa. Market Development Conference.

26-30 . . American Society of Tool Engineers' Industrial Exposition
Convention Center, Philadelphia.

May

5-7 . . American Society of Training Directors
Schroeder Hotel, Milwaukee. Annual Conference.

8-14 . . AFS Convention & Exhibit
Public Auditorium, Cleveland.

June

14-15 . . Malleable Founders' Society
Seigniory Club, Quebec, Canada. Annual Meeting.

14-18 . . American Society for Testing Materials
Hotels Sherman and Morrison, Chicago. Annual Meeting.

September

13-25 . . First International Instrument Congress & Exposition
Philadelphia Convention Hall, Philadelphia, Pa.

November

1-5 . . National Metal Congress, National Metal Exposition
Palmer House, Chicago.

Despite snow on ground, weather was generally good during and after holiday season, permitting rapid progress on new AFS Headquarters building and Foundry Technical Center at Des Plaines, Illinois.

Walls Rising as AFS Building Fund Reaches $220,000 Total

TAKING advantage of the continued moderate weather, brick work had been finished up to 6 ft around half of the new AFS headquarters and Foundry Technical Center in Des Plaines, Ill., by the end of January.

In addition, all of the steel columns and some of the steel joists were scheduled to be set by that time, together with completion of part of the roof framework. Actual laying of the roof was to begin by the first week of February.

Earlier in January, most of the drainage work had been completed, with 90 per cent of all pipes and sewers installed. All water mains were laid and the basement had been finished.

With a capacity sufficient to circulate hot water through 15,000 sq ft of floor space, the heating boiler was set early in January. The 2000-gal capacity oil tank was also mounted, filled with fuel oil, and buried.

Construction, in general, is proceeding at a rapid rate and America's first Foundry Technical Center will be a reality late in the summer. It will be a lasting monument and testimonial to the farsightedness of those men comprising the metals casting industry on this continent.

Meanwhile, the limited solicitation to raise the funds for the construction of the building had reached $220,000 as January began. Following is the list of new contributors in the period December 7, 1953-January 4, 1954. Asterisk (*) indicates that an additional contribution is being made.

***Ajax Electric Furnace Corp.**	**Trenton, N. J.**
***Ajax Electrothermic Corp.**	**Trenton, N. J.**
***Ajax Engineering Corp.**	**Trenton, N. J.**
Alabama Pipe Co.	**Anniston, Ala.**
Alamo Iron Works	**San Antonio, Texas**
Allis-Chalmers Mfg. Co.	**Milwaukee**
Aluminum Industries, Inc.	**Cincinnati**
***American Brass & Iron Foundry**	**Oakland, Calif.**
***American Colloid Co.**	**Chicago**
American Malleable Castings Co.	**Marion, Ohio**
Anchor Foundry Co.	**San Francisco**
Atlantic Foundry Co.	**Akron, Ohio**
***Auto Specialties Mfg. Co.**	**St. Joseph, Mich.**
***G. A. Avril Co.**	**Cincinnati**
Baker Perkins, Inc.	**Saginaw, Mich.**
***Belle City Malleable Iron Co.**	**Racine, Wis.**
Beloit Foundry Co.	**Beloit, Wis.**
***T. H. Benners & Co.**	**Birmingham, Ala.**
Berlin Chapman Co.	**Berlin, Wis.**
***Birdsboro Steel Foundry & Machine Co.**	**Birdsboro, Pa.**
Bostick Foundry Co.	**Lapeer, Mich.**
***Brillion Iron Works**	**Brillion, Wis.**
Bronze Alloys Co.	**St. Louis, Mo.**
Buckeye Foundry Co.	**Cincinnati**
Buckeye Mfg. & Foundry Co.	**Hamilton, Ohio**
Buehler, Ltd.	**Chicago**

continued on page 94

Effect of Prebaking In Malleablizing Iron

FLOYD BROWN / *Research Assoc. Prof. of Metallurgy, North Carolina State College*

Prebaking hard iron forms graphite nuclei. This does not require hydrogen which, in fact, inhibits the prebaking effect. Written discussion of this paper, Preprint No. 54-14, should be sent to American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill. The paper will be presented at a Malleable Session of the AFS 58th Annual Meeting, Cleveland, May 8-14, 1954.

■ If white cast iron either is held isothermally at some subcritical temperature or is heated slowly through the subcritical range, many more graphite nodules develop during subsequent first stage malleablizing than develop if the white iron is heated rapidly to the first stage temperature without an isothermal pretreatment. This will be termed here the prebaking effect. There appears to be an optimum temperature for this prebaking for maximum increase in nucleation, an optimum which Schulte[1] estimated to lie between 350 and 450 C.

Four-fold Relationship

It seems reasonable to suspect that this effect may be related somehow to four others: (A) There is a maximum in the rate of nucleation of graphite in quenched steel at about 660 C[2]; (B) Prequenching white cast iron before malleablizing increases phenomenally the number of graphite nodules formed during first stage malleablization, but only if martensite is formed during the quench[3]; (C) No extra graphite nucleates during slow preheating of white iron in hydrogen (prior to malleablizing), although it does in argon (which is inert), and it does not do so in argon if the iron has been previously preheated slowly in hydrogen[4]; (D) There appears to be a maximum in the rate of graphitization of pearlite in malleable iron at about 700 C.

The prebaking effect has been rationalized as one involving in some way the removal of hydrogen—perhaps leading to some sort of structural disruption sites which would be favored locations for nucleation of graphite[5]. The following experiment was conducted in order to examine the adequacy of this view.

Specimens (1/8-in. quartered slices from the barrel of tensile bars) of two irons whose compositions are shown in the table were prebaked in air for 30 minutes at temperatures ranging from 250 C to 700 C, after which they were air cooled; this constituted Series I. Specimens constituting a second series (II) were held in flowing butane one hour at 700 C after which they were air cooled. Specimens from Series II were then given the same prebaking (in air for 30 minutes at temperatures ranging from 250 to 700) as Series I. Both series were heated (in separate batches to obviate any contamination of Series I with hydrogen from Series II) to 950 C in air, held 2.5 hours, and quenched. In all the resulting specimens, first stage graphitization was well under way but in no case was it complete. The number of nodules per unit area was counted and converted to the number per unit volume by raising to the three-halves power. The data are shown in the graph.

The optimum prebaking temperature (Series I) is seen to be 400 C, in the middle of the range estimated by Schulte. Since the irons used represent a considerable range in silicon content, it is reasonable to expect all commercial irons to show substantially the same optimum. It is suggested that if one were interested in a maximum number of nodules for maximum malleablizing rate, the annealing schedule should include a hold at 400 C for about one hour prior to the first stage.

The hydrogen provided by the thermal decomposition of butane in the prebaking strongly inhibited graphitization but not spheroidization of the smaller carbides[6], which occurred in one hour at 700 C to a very much greater degree than occurred subsequently in 30 minutes at 550 C or lower. Thus, although spheroidization occurs during ordinary prebaking, it had

ANALYSES OF IRONS

Composition	Iron A	Iron E
Silicon, %	1.59	0.96
Sulphur, %	0.161	0.156
Phosphorus, %	0.03	0.121
Manganese, %	0.48	0.40
Total Carbon, %	2.34	2.60

already proceeded so far during the 700 C soaking in butane that relatively little more took place during subsequent baking. The rate at which spheroidization takes place falls off continuously as the process continues, even at the same temperature, and it falls off very rapidly as the temperature is decreased.

The soaking in butane, however, left the specimens charged with hydrogen. (Series II was quickly transferred after cooling from the butane soak to the first stage malleablizing furnace.) The butane soaked specimens gave about the same number of graphite nodules as the untreated, indicating that the hydrogen (to whose presence nucleation and growth of graphite during first stage malleablization is very sensitive) had been removed; but the process of the removal of this hydrogen obviously did not cause any increase in number of nodules.

Conclusions

1. The prebaking effect does not require involvement of hydrogen, though hydrogen—persisting awhile at the lower prebaking temperatures—would move the bottom of the Series I curves even farther to the left and hence accentuate the maximum.

2. The maximum is concluded to be caused by competition between (a) spheroidization of carbides, which retards the nucleation and growth of graphite, and (b) the carbon diffusion coefficient. Both of these increase with increasing temperature. The spheroidization factor predominates at high temperature, causing the nucleation to drop off there because of rapid spheroidization, and the diffusion factor predominates at low temperature, causing the nucleation to drop off there because of low diffusion rates.

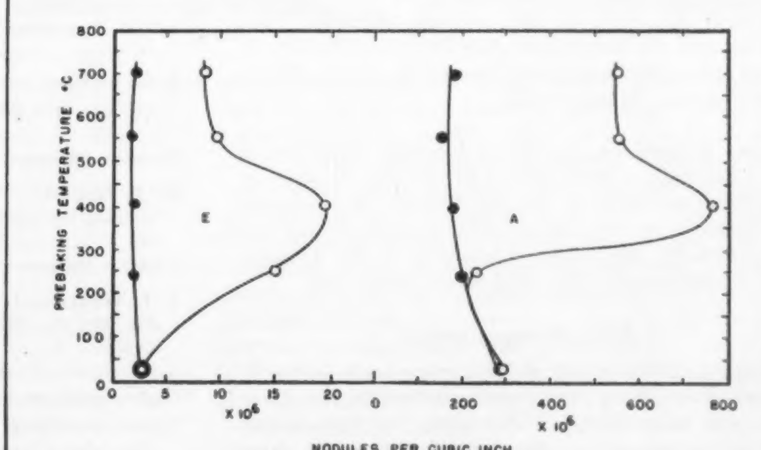
3. The maximum in the subcritical nucleation of graphite in these two irons is at about 400 C. The differences between this temperature and the optimum nucleation temperature in the graphitization of steel and the optimum in the graphitization of the pearlitic matrix in malleable iron need not be perplexing if it is kept in mind that the processes involved in these three are different. In prebaking hard iron, the process is one of providing a nucleus, the growth of which to visible size occurs at a much higher temperature; in steel both nucleation and growth to measurable size at the same temperature are involved; and in graphitizing the pearlitic matrix in malleable iron, only the dissolution of pearlite and the movement of its carbon to the nodules already present is involved. The only common graphitizing units of these processes are the movement of the carbon out of cementite and its deposition as graphite.

4. Conclusion 2 is consistent with the view that the site of nucleation of graphite is at the surface of the carbides. This site has long been considered the most likely for graphite nucleation, though the evidence has been scant and continues to be indirect.

5. The prequenching effect (B) undoubtedly works by producing many sharply rounded carbides arising from the tempering of the martensite, a view also long held. Conclusions 2 and 4 support this.

6. Palmer's slow preheating in hydrogen simply served to spheroidize the carbides under non-graphitizing conditions, so that on subsequent slow heating in argon the spheroidized iron was too stable to show any subcritical nucleation.

7. That the process which occurs during prebaking is truly the formation of a graphite nucleus and not some other reaction which later supplies a favorable site for graphite nucleation is supported by the fact that hydrogen, which inhibits all graphitizing reactions, inhibits the prebaking effect.



Nodules vs. Prebaking Temperature

Acknowledgements

The irons used in this experiment were provided by members of the Malleable Founders' Society through the kind assistance of James H. Lansing, technical and research director. The experimental work was performed by Cedric Beachem and was supported by the Department of Engineering Research, North Carolina State College, N. W. Conner, director.

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5. C. H. Lorig and M. L. Samuels, "Some Effects of Hydrogen on the Time of Malleablization," *Symposium on Graphitization of White Cast Iron*, p. 107 (1942).

6. Floyd Brown and M. F. Hawkes, "Effect of Hydrogen on Graphitization," *Transactions* AFS, vol. 60. p. 635 (1952).

Frank J. Dost

Bruce L. Simpson

New Officers and Directors Nominated by AFS Committee

Acting in accordance with the new AFS by-laws, the Nominating Committee met in Chicago on December 11, 1953 to select candidates for Society offices and to effect reorganization of the Board of Directors.

Frank J. Dost, president, Sterling Foundry Co., Wellington, Ohio, has been nominated for election as President of the Society for 1954-55, upon conclusion of his present term as Vice-President. As stipulated by the Society's new by-laws, effective December 1, Mr. Dost will take office on May 15, 1954 . . . "the day following the close of the Annual Meeting." He will succeed the incumbent AFS President, Collins L. Carter, president and general manager, Albion Malleable Iron Co., Albion, Mich.

Bruce L. Simpson, president, National Engineering Co., Chicago, has been named to succeed Mr. Dost as Vice-President, to serve during 1954-55. Mr. Simpson was formerly a Director of AFS, serving during the years 1946-49. He is also Chairman of the Trustees who administer the AFS Staff Retirement Plan.

Board Reorganization

Since the AFS Board of Directors is now being increased from 18 to 24 members, including the President, and immediate past President, the Nominating Committee named six Directors for terms of three years each, one Director to serve two years, and one Director to serve one year. The following is a list of the new nominees:

Directors (each to serve three years)—

Harold L. Ullrich, works manager, Sacks-Barlow Foundries, Inc., Newark, N. J.

William A. Morley, foundry manager, Link-Belt Co., Olney Foundry, Philadelphia, Pa.

Eugene R. Oeschger, general manager, Foundry Department, General Electric Co., Schenectady, N. Y.

Frank C. Cech, instructor, Cleveland Trade School, Cleveland.

W. M. Hamilton, manager, Crane Co., Chattanooga Division, Chattanooga, Tenn.

B. G. Emmett, works manager, Los Angeles Steel Casting Co., Los Angeles.

Director (to serve two years)—

W. R. Pindell, manager, Northwest Foundry & Furnace Works, Inc., Portland, Ore.

Director (to serve one year)—

J. T. Westwood, Jr., president, Blue Valley Foundry Co., Kansas City, Mo.

In addition, current Society President Collins L. Carter will automatically serve one year as Director upon completion of his present term of office.

The above nominations for Officers and Directors are announced in accordance with the AFS by-laws,

Collins L. Carter

Harold L. Ullrich

B. G. Emmett

Eugene R. Oeschger

W. M. Hamilton

Frank C. Cech

William A. Morley

W. R. Pindell

J. T. Westwood, Jr.

which require that the report of the Nominating Committee be published at least 60 days prior to the Annual Business Meeting, which will be held on May 12, during the Cleveland Convention and Exhibit. The regulations state further that, at any time up to 45 days prior to the date of the Meeting, additional nominations may be made by written petition, signed by 200 or more members in good standing, and filed with the Secretary of the Society.

If no additional candidates are named by petition, the AFS Secretary is authorized to cast a unanimous ballot of the entire membership for election of those candidates named by the Nominating Committee. In any event, the elections will be held at the Annual Business Meeting.

In addition to those nominees selected by the Nominating Committee, the Society's new by-laws provide that the AFS Board of Directors shall appoint one Director annually for a three-year term. In order to put this new regulation into effect, this year the Board will appoint three Directors—one for a three-year term, one for two years, and one to serve one year. This procedure is being followed so that one of the Board-appointed Directors will conclude his term of office each year, enabling the appointment of but one new Director annually for a three-year term in the future, without exceeding the by-law limitations.

Director appointments by the Board will be made at the next scheduled meeting of that group, to be held February 22-23. These appointed Directors will be introduced at the Annual Business Meeting on May 12, and will take office on May 15.

Work Simplification Saves $300,000 in Six Years

Through the use of this "scoreboard," (arrow) hung outside the laboratory window, the current carbon percentage can be read by the melting foreman as soon as the determination is made. This method overcomes the handicap of the considerable distance between cupola and laboratory. Shop noise makes use of the telephone impractical much of the time.

W. S. WILLIAMS / *Work Simplification Director, Lynchburg Foundry Co., Lynchburg, Va.*

Work simplification and training of employees to develop methods of doing work in the most simple way have saved Lynchburg Foundry Co. $300,000 in six years. The author gave his philosophy of work simplification at the 25th anniversary meeting of the Gray Iron Founders' Society.

W. S. Williams

■ Work simplification means many things to many people. For this reason it is well to begin by defining the author's particular conception. The field of industrial engineering had been hampered by a jungle of overlapping and ambiguous terms until a glossary (*Glossary of Terms Used in Methods, Time Study, and Wage Incentives,* Society for Advancement of Management, New York, 1952) was recently published which greatly clarified the situation.

Work Simplification in industry has most often been confused with the field of Methods Engineering. The Glossary defines methods engineering briefly as "the application of analytical techniques to the development of improved methods of doing work." The definition of work simplification is "the organized application of common sense to eliminate all waste —of time, effort, material, equipment or space."

Eliminate waste implies action and results. This broad field encompasses not only the technical problems of developing better methods but also the quite different psychological problems of getting these methods accepted and put into use. It means working not only with the method itself but with the people who must put the method to work. Consider work simplification in that light—practical methods engineering with the accent on the individual.

What principles are behind this concept of work simplification? How is a practical program applied to a foundry operation? What results can be accom-

plished? The answers can be found by tracing the origin of work simplification.

The idea of work simplification was born some 20 years ago in the minds of some of the early industrial engineers who were applying the principles of scientific management as developed by Taylor and Gilbreth to the industrial problems of that day. Having repeatedly developed and installed better methods and processes only to return a few months later and find that the people on the job had reverted to their old methods, they realized that something was lacking. They recognized the fact that it is not enough just to develop a better method. The job is not over until acceptance of that method has been developed as well.

Some experts may still be able to take the attitude, "Well, I showed 'em how to do it. If they don't want to use it, that's not my fault!" But the fact is that a better method is just a thought idly bouncing around is someone's head until it is made a part of the job by the person who performs that job. To exploit fully a new idea, someone must take the responsibility of selling that idea, of getting that enthusiastic acceptance on the part of all the people concerned which makes a new method really work.

Six-tipped tool designed by coremaker replaced a file for rubbing fins out of small holes in core, cutting time required for this type of operation in half.

Spare wheel guard cover of airless blast machine is inverted beside working counterpart to show how inside is lined with old impeller blades, reducing shot wear.

Realizing that their approach was falling short of its mark because of this lack of acceptance of their ideas, this group of pioneers, under the leadership of Allan H. Mogensen, developed a new way of thinking and called it work simplification.

A Selling Problem

The problem boiled down to one of selling—a most difficult job, for it involved the selling of ideas, of intangibles.

The best way to get someone to accept an idea is to make him feel that it's his idea. Even if it is only partly his idea, by making it possible for him to contribute something to its development, the necessity of "selling" him has practically been eliminated. Acceptance has been gained by allowing him to participate. Two things have happened: the idea is sold, and also it is probably a better idea because of his participation in it. Here is one of the cornerstones of work simplification.

Participation in developing better methods, brings one squarely into the first stumbling block. The responsibility for controlling the efficiency of a modern large company is usually placed in the hands of industrial engineers and other trained experts. It is only natural for this group to feel that their domain is being invaded. What work simplification actually does, however, is to supplement their work by taking care of the details, leaving the engineers free to concentrate on major problems which require their technical ability.

Self-Policing

Work simplification proposes that each employee be made responsible for, and capable of, policing the efficiency of his own job. This means that management must provide each employee with the training and the tools and techniques required to make him capable and responsible.

Any successful procedure for converting this broad philosophy into a workable program must be built around management's recognition and application of these four principles:

1. The collective brainpower of individual employees is a great potential asset, and it is a worthwhile investment to cultivate that brainpower so that it will be applied to the betterment of the company.

2. Through training, this potential asset can be made effective.

3. The individual can be induced to utilize this trained ability by providing appropriate incentives, and these incentives need not be cash.

4. Channels of communication must be established to assure that employee ideas are evaluated impartially and correctly, and installed when sound.

These principles can best be illustrated by showing how they have been applied at Lynchburg Foundry Co.

Training can cover not only the "know how" of methods improvement but can afford an excellent

When threads on this lathe jig stripped out, whole jig had to be removed while holes were built up, redrilled, and retapped. Now, this special cylindrical nut, designed by machinist, is simply knocked out and quickly replaced with spare, without production loss.

opportunity to provide some of the incentives. Participation is based on understanding. With this in mind, training sessions are usually initiated with discussions of some of the basic economic facts of life. Unless the average worker understands where he fits into the over-all industrial picture and how he personally benefits from lowered costs and increased production, it is a waste of time to try to get him to originate methods improvements. With the average foundry worker, Lynchburg spends up to 40 per cent of the total work simplification training time on education of this type. It is a vital and most necessary part of the program.

The Basic Fundamentals

Providing the "know how" involves the presentation of the basic fundamentals of methods engineering and motion economy in as simple and logical a manner as possible. Employees are shown how any problem can be reduced to simple steps and solved in an orderly manner by using a time-tested pattern. The trainee is introduced to such tools as the flow process chart, the operator chart, and others. Also included are discussions on selling ideas and the difficulties involved. Basically, the idea is not to make an expert out of anyone, but merely to show the trainee some practical techniques and give him confidence in his ability to use them. The goal is to organize his common sense.

Work simplification training sessions are kept as informal as possible. Liberal use of films, demonstrations, and examples of actual foundry jobs help make the meetings interesting. The course length varies from 10 hours for the line workers to 20 or more hours for supervisors and managers. This is not necessarily adequate, but it is a beginning. Management from president to foreman, and the engineering staff, have taken work simplification training and a program to present the material to every worker in the shops was recently initiated. In the six years since the program was established, 469 persons have spent over 6000 man-hours in the classroom. Around 150 trainees a year are being handled now.

The real value of any training program is dependent on the degree to which the trainees can actually put to use what they have learned. Here, the difference between an idea in someone's head and the installation of that idea as a part of the operations must be recognized. Some positive plan must be established to help bridge that gap.

Business End of the Program

To serve that purpose the Proposal for Improvement Plan has been set up. Its function is to provide for the collection and impartial evaluation of all ideas, to assure that acceptable ideas are promptly installed, and to give recognition to the originator of each acceptable idea in proportion to its value. This is the business end of the work simplification program.

Here are a few of the more important aspects of the Plan.

The key to any successful "idea plan" of this type is sincere management backing. If a plan is set up with the idea of merely skimming the cream off the reservoir of employee thinking with the least amount of expense and effort, it is doomed to failure and will leave some wounds in employee relations which won't heal quickly.

An employee who submits an idea which results in lower costs or increased production is certainly entitled to receive some recognition of this contribution. There are all kinds of ways of providing this recognition which is, of course, an incentive also. Lynchburg, as do many others, pays cash awards. There is no question of the value of cash as an incentive, but it is most important that awards are handled in such a manner that the money does not assume a greater importance than the idea itself. Remember that the basic purpose of such a plan is to make possible the contribution of ideas, not just to increase take-home way.

To those who might compare this description with the conventional employee suggestion system, one distinguishing difference should be pointed out. The vast majority of suggestion systems are independent functions within a company, usually falling within the bailiwick of industrial relations. On the other hand, the Proposal Plan does not stand alone, but is just one part of the over-all work simplification program.

The first and most tangible results of a Work Simplification Program will come from those ideas for improvement originated by employees—direct savings of labor and materials, actual elimination of waste. Every year the author's company is receiving and installing ideas which average approximately $20,000 net annual savings. Total benefits which have accrued since the program started six years ago amount to over $300,000.

These figures are not necessarily complete since the

only records kept are those of the Proposal for Improvement Plan. It is significant that lately many improvements are noticed in the shop which have not come through as formal proposals. Supervisors particularly, who used to submit proposals two or three years ago even though they did not benefit financially from them, now have learned enough about presenting and selling their ideas that they can gain acceptance without availing themselves of the Proposal Plan channel.

Some of the Ideas

Here are a few of the ideas that have been submitted and used recenetly:

Two millwrights practically eliminated wear of certain interior parts of a blasting machine by welding old impeller blades over those parts of the cabinet which were hit by the tail of the shot stream. That saves $1700 annually in maintenance costs.

A laboratory technician recognized that every car of pig iron used for pipe making was being analyzed even though the shipper's analysis was used for charge calculations. Even if a discrepancy had been discovered, the pig iron had been used before the result of the laboratory analysis was available. Changing to a system of spot checks saves $1100.

A coremaker designed a lighter runner box core so that he could blow two cores instead of just one each time he filled the head of his blower. Savings in sand and labor amounted to $1200.

A molder suggested a new design for a production core which not only reduced scrap but resulted in labor and material savings of $7056.

These ideas were all originated by foundry wage earners who took advantage of the opportunity to work with their heads as well as their hands.

Intangible Benefits

Without any intention of discounting the dollars and cents savings, it can be reported that as the program grows older, it is felt more and more that the greatest benefits are of an intangible nature. This was brought out by operating supervisors whose departments had recently completed work simplification training. These supervisors, some of whom had originally been skeptical of work simplification, voluntarily reported a marked improvement in attitude among their men, a decrease in complaints and grievances, and in general a healthier working atmosphere.

There is a much better understanding of the need for methods studies, changes, and rate reductions. Union officers take as active a part in the program as anyone. There is a growing realization by all of the value of the Proposal Plan as a means of getting worthwhile changes made, and not just as a source of awards.

In view of these intangible effects, one thing is certain. In evaluating a Work Simplification program the dollar savings realized are just one aspect of it. Good or bad, the indirect results reflected by amployee attitudes are all-important.

Work simplification is not a package or a system simply to be installed. It is not a shot in the arm to bolster a sagging cost reduction program.

Drop-leaf tables installed beside core conveyor as result of idea for place to clean and assemble cores. May be dropped out of way when not in use.

A service man made his job of separating sand and iron much easier and faster by proposing this extension to the chute from a magnetic pulley. The great majority of the sand pulled off the conveyor belt by the iron passes through this screen, while iron slides up into the wheelbarrow. A typical simplification idea.

Work simplification is a broad philosophy based on the participation of the individual. When management makes it possible for everyone to contribute to the job of reducing waste, valuable cooperation in that important activity can be expected. Then, a common goal having been established, mutual understanding and confidence are the natural result.

Keep the Human Element

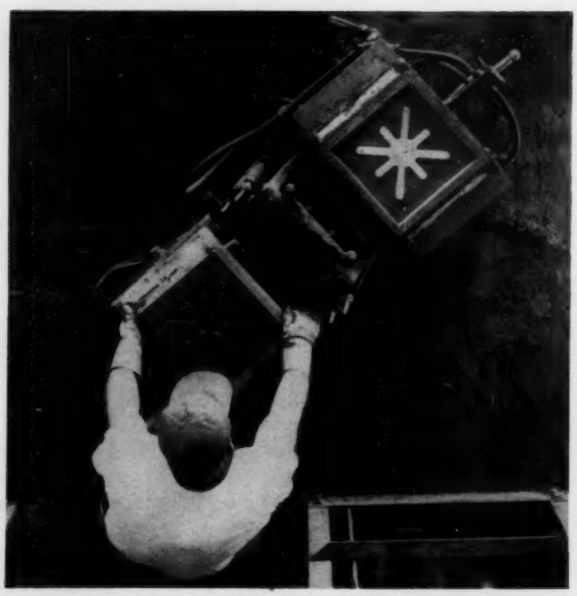
As foundries become more and more automatic, the human element is being taken out of the casting, but it is doubtful if it will ever be taken out of the foundry. The working man is being deprived of the pride he used to have in his skill and his ability to work with his hands. Through work simplification, he is offered even greater satisfaction from the accomplishments of his own thinking. And when he contributes that thinking to the company's efforts to make a better casting at a lower cost, an invaluable communication link is established.

Work Simplification is the key to open many doors. It is truly a great opportunity for any company. As labor supply and competition force efficiency, foundries should explore all its possibilities.

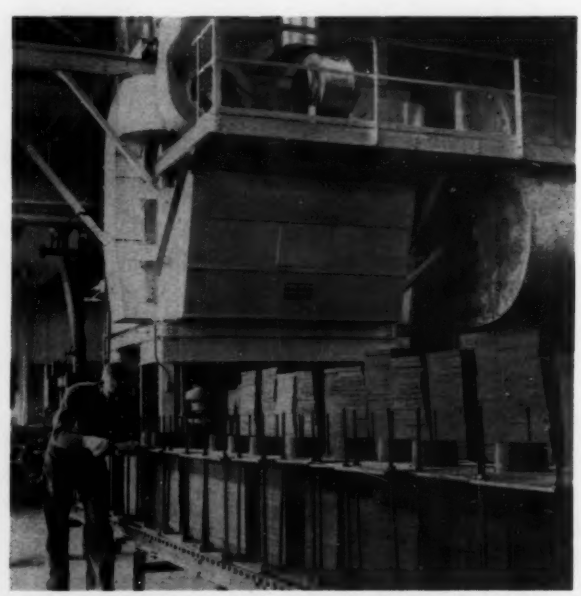
Each of 52-ft silos stores 250 tons dry sand, has 30 tons "live" sand available at touch of push-button.

General Electric's Carboloy Department has built one of the world's most modern plants for the production of Alnico permanent magnets at Edmore (pop. 801), in the west-central Michigan resort area. In full production, over 2200 different sizes and shapes of permanent magnets will be manufactured. More than one and one-half miles of mechanized materials handling equipment in the 128,939 sq ft of manufacturing floor space bring the production process almost to automation. Produced from sand stored in two concrete silos, baked sand molds or core slabs are used exclusively. The mulled core mix, consisting of dried bank sand, cereal binders, core oil and water, is molded in conventional jolt rollover machines and in core blowers. After baking, the cores are stacked about ten-high, with steel top and bottom plates. A pouring cup is set at the top of a central sprue. Six induction furnaces melt the aluminum-nickel-cobalt-copper-iron alloy, pour directly into molds at 3240 F. After cooling under exhaust hoods, cores are shaken-out on vibrating tables, and waste sand is taken to disposal hoppers outside the building. Castings are cleaned in airless blast tumbling units. The magnets snap off from the sprues readily, require little rough grinding. After heat treatment, they are again blast cleaned, finish ground, partially magnetized, and prepared for shipment.

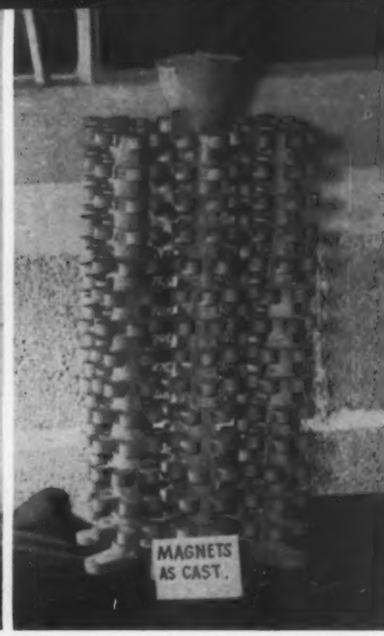
New Mechanized Foundry Casts Permanent Magnets



After mulling, sand is molded on jolt rollover machines of this type, and in core blowers.



After baking in vertical oven (background), cores are stacked between steel end plates, ready for pouring.



Stacked cores are conveyorized to electric induction melting furnaces. After pour-off, they are conveyed through exhaust hoods for cooling. Magnets are cast in trees (right) with central sprue for pouring.

Waste core sand is conveyed to bucket elevator (center), then taken to 30-ton hoppers (foreground above). Bucket gates at bottom release sand into disposal trucks.

After shake-out, magnets are sand blasted, rough ground, then heat treated. Worker shown is loading a tray which conveys magnets through heat treating furnace.

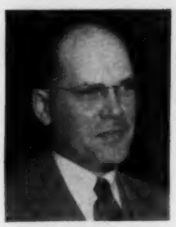
Exit end of automatic, roller-hearth, heat treating furnace. Production of unit is over 500 lb per hour.

After demagnetizing, magnets are finish ground. Operator is loading double-spindle grinder fixture.

How Far Should We Go In Foundry Sand Control

EARL E. WOODLIFF/*Foundry Sand Engineer, Detroit*

Sand control becomes increasingly complex as more and more sand additives and sand test methods are developed. A foundryman can go as far as he likes in controlling sands but he will always profit by observing well-established fundamentals in his molding operations.



E. E. Woodliff

■ No foundry is too large or too small to accept at full value the improvements to be had with controlled sands. These include not only better working qualities in molding and core sands but also improved casting finish.

Too frequently foundrymen consider the purchase of sand testing equipment as the end point in sand control. It is only the beginning. The quality of the control depends to a large extent upon the ability of the individual charged with the duties of sand control and testing.

Control Necessary

Sand testing without sand control is largely wasted effort. Too frequently sand tests are made more to fill the blank spaces on some report form than to learn the actual condition of the sand. If this condition exists in a plant, the number of tests should be reduced by one-half or more and the data *used* instead of filed. Or at the end of each day one can take the daily average of each property and record this either by plotting on a graphic form or recording on a long term control sheet. This simplifies study of the daily average sand properties and brings out trends.

Whichever means is employed, single daily tests, many tests, or hunches, the important thing is the application of the remedy to make the sands fall in line. Sand control should be continuous and not just a once-in-awhile program. Sand responds readily to control exercised upon it, but the odds are 10 to one against the foundryman if a do-nothing policy is adopted.

The best person to exercise control over the sands, by establishing mixes and conducting experiments, is the sand control supervisor. It is best when he makes the tests himself. He is in the best position to judge

Return production unit sand is conditioned in these sand mills at rate of 2600 lb every five minutes. Operations, including cooling, are under automatic control. Water additions are made by passing 90 per cent through automatic timer, completed by operator, who judges additions by aid of calibrated dial thermometer. Photo courtesy Dodge Mfg. Corp.

sand mixes and to watch results by observing castings in the cleaning room. The man who is working on sand testing should be included in scrap meetings and foundry discussions.

The most important control man in an organization is the man in charge of ordering or specifying the basic raw materials. When he places an order for a carload of sand or clay or seacoal or silica flour or cereal binder or core oil he is in effect, controlling the foundry's sand for the period during which these materials are being used in production.

Consider Synthetic Bonding

In a production foundry where castings are shaken out mechanically, strong consideration should be given to the use of a synthetically-bonded molding sand. The main consideration, sand-wise, is the type of sand used for making cores, for with mechanical shakeout much of the core sand will enter the molding sand. In fact, it is normally considered that ample sand from the cores will be available to supply the

Typical daily sand test report by large non-ferrous foundry. Most properties are established between high and low test limits. At end of each day the reports on each property are averaged and those falling outside the limits are circled for quick reference by control personnel.

Date 11/13/53 — BRASS FOUNDRY DAILY SAND REPORT — Prepared by Anthony Schultz

Time	Moisture 5.0-5.6%	Perm. 18-23	Gr. Comp. psi 8.0-9.5	Flow %	Density-- Wt. in Grams 164 min.	Dry Comp. psi 50-80	Clay % 10-12	Deform. IN./IN. 0.013-0.021	Toughness (GC x DEF. x 1000) 105.0-198.0	Floor Number	% Coarse (Plus 50) 5.0% Max.	% Fine (Minus 140) 36% Min.	AFS Fineness 125-143	% Pan Material 6-12
7:00	4.6	21	10.4	71	168			0.014	145.6	7	40 lb. Silica Flour 20 lb. Fire Clay			
8:00														
8:30	4.4	21	11	72	168	60 & 64	15.6	0.014	154	6		Same		
9:00	4.7	21	11.4	73	168			0.014	159.6	10		Same		
9:30														
10:00	4.9	21	10.4	72	168			0.014	145.6	3	40 lb. Silica Flour 10 lb. Fire Clay			
10:30														
11:00	4.8	21	10.4	72	168			0.014	145.6	9		Same		
12:30	4.8	21	11	72	168	74 & 76		0.014	154	11		Same		
1:00	5.0	21	10.1	72	169			0.015	151.5	3		Same		
1:30														
2:00	4.8	21	11	73	168			0.014	154	5		Same		
2:30														
TOTAL	38.0	168	85.7	577	1345	271	15.6	0.113	1209.9					
AVERAGE	4.75	21	10.71	72.1	168.1	68.5		0.0141	151.23		1.4	35.6	125.55	8.8

Gas Determination	
Total	203
Blank	143
CC/GR	12

Expansion	0.0194
Contraction	0.018
Stability	0.0374
Hot Strength	

Flour________
Sand________
Blend Mix________
Misc.________

needs of such a sand system. It is necessary, therefore, that the same type of sand be used in the cores as is desired as a base sand for the molding unit.

If the foundry is a floor type shop and the molders' heaps are maintained by additions of new sand directly to them, it is well to consider natural molding sand practice. These two types overlap and there is no sharp line of demarcation. Often production systems are found in which a quantity of natural molding sand is being added, and frequently a jobbing or floor molding foundry will use some raw, clay-free sands in the facing mixtures.

Clay Content vs Bond Strength

The reasons for these practices are quite simple. They lie in the differences in clay content or relative clay content vs. bond strength. Consider the clay content (AFS clay substance) in its relationship to green compressive strength or bond strength. In most naturally-bonded molding sands, the clay content is normally twice that of the green strength readings. Thus, in an 18 per cent clay sand the green strength will test in the range of 9 psi. When this sand is mulled thoroughly the green strength will increase about 50 per cent and will then be equal to about 75 per cent of the clay content or 13-14 psi. This is a case of a relatively weak clay and a large clay volume.

In the case of the stronger and "fatter" clays so frequently used for bonding purposes, this relationship changes. There are strong clays, such as the western and southern bentonites. There are medium strength clays, such as the pulverized fireclays from Ohio, California, Texas, and Illinois. And, there are the weaker clays from Missouri, Illinois, Georgia, Alabama, and Michigan. The strong bentonite clays and pulverized fireclays are best when mulled into sand as they are too fat to otherwise blend without thorough mechanical mixing. The earthy and weak fireclays can be cut in with a sand cutter, a muller, or a shovel.

The difference lies not so much in the type of clay used as it does in the clay content derived from their usage. The bentonites, when mulled, develop about 1½ psi green strength for each per cent of bentonite present. The medium-strength pulverized fireclays will give about one pound of strength for each per cent of clay present in the mixture. The weak fireclays and earthy clays will develop one pound strength for each 1½ per cent of clay in the mixture, when mulled. This is shown in Table 1 which shows the amount of different types of clay bond needed to give a 9-psi green strength.

From this it is easy to see why a production unit sand can be improved by the addition of a natural clay to supplement the bentonites or fireclays for it makes possible a building up of clay substance without seriously increasing green strength and destroying flowability. On the other hand, floor-type foundries can build up green strength with a minimum of clay substance by supplementing the natural-clay sands with an addition of a stronger clay or bentonite. This is advisable in mulled facings at least.

The basis for this practice is that most molding sands work best when containing between 11 and 14 per cent clay substance. Below this range they dry out rapidly and have greater tendency to buckle because of high thermal expansion. Above this range of clay content they tend to form clay balls, become sticky, and have a lower fusion range which may lead to scabbing and erosion.

A Fundamental Basis

Control of clay content is one of the most important fundamental bases of molding sand control. When clay substance is low it is necessary to add stabilizing materials. Steel foundrymen use cereal binders. This, too, is used by other ferrous and by non-ferrous foundrymen. Wood flour, special carbonaceous and cellulose products, and other combustible materials are used for the same purpose, mostly in gray iron foundries. All these materials serve a useful purpose, but are made more necessary when the sand's clay content is out of balance.

Seacoal, pitch, and other hydrocarbons are commonly used in gray iron and malleable molding sands.

Floor molder spraying and finishing cope section of large flywheel mold. Blackening spray has excellent penetration into sand, which will assure maximum smoothness and minimum metal penetration. Mold will be skin-dryed and cast the same day. High quality workmanship and controlled sand keeps scrap at very low figure in this foundry.
Photo courtesy Dodge Mfg. Corp.

Pouring of steel molds on a high-production unit. The molds are rammed with a slinger, and for the most part, are made of green molding sand. Control of the sand and ramming is an established part of this foundry's regular production operations.—Photo courtesy Oklahoma Steel Castings Co., Inc.

They are so important that their control may well rate second only to control of the moisture in the molding sand. Therefore, control of this class of materials may be considered fundamental. The use and application of these sand additives is founded upon the desire to improve sand "peel" and casting finish by depositing on the mold surface a coating of carbon. This coating is not very durable. It is adaptable only to light weight castings or thinner metal sections.

For the heavier castings it is necessary to use a carbon coating which is brushed or rubbed onto the mold surface or a carbon wash which is sprayed on the surface and the water then evaporated, leaving the heavier coating of protection. Thus, the heavier the work the heavier the layer of carbon or graphite that must be deposited or placed on the mold surface.

The use of these materials is fairly well understood, but too frequently the user fails to consider the control or the correct application of the different materials. This is to a large extent a function of the durability of the seacoal, pitch, or blacking. It is dependent upon the rate at which each gives up its gas in the case of seacoal and pitch. Seacoal burns more or less in direct ratio to its fineness of grind. The E and F grades burn most rapidly while C and D fineness burn more slowly and should be used with heavier work. Pitch burns more slowly than C and D grades of seacoal. It is considered good practice to supplement seacoal with pitch in making heavier work of the 1000-lb class in green sand.

Carbon mold coatings are suspended ground carbon supplemented with varying amounts of plumbago in water solutions. They require that a binder which dries hard be added to hold them in place during drying and afterwards. They present a high impervious surface to the metal which means maximum mold protection.

An often overlooked function of seacoal, pitch, and hydrocarbon sand coatings is their effectiveness as sand stabilizers. They are so effective in this connection that they often arrest and control a sand's thermal expansion and contraction, controlling not only burn-on by increasing the apparent refractoriness but also buckles and scabs over a wide range of molding abuse. Therefore, these materials offer a safer sand in the malleable and gray iron foundry when control is exercised over their use.

Care in Selection

The principal difference between sands for non-ferrous foundry use and those for iron foundries is the fineness and the almost complete absence of any organic or combustible materials in the non-ferrous sands. This means the use of molding sands, usually the naturally-bonded type, which have to be selected with the greatest of care. Since stabilizing materials, such as wood flour, cereal flour, seacoal, cellulose, and pitch are all more or less gas-forming and the average non-ferrous metal is absorptive of gas, their use must be either very limited or they must not be used at all. The following conditions are of great importance when selecting sand for making brass, bronze, and aluminum castings.

The sand for molding must be selected with a fineness sufficient to give a suitable finish to castings. This usually is in the fineness range of 120 to 170. The clay should be in the range of 12 to 18 per cent for naturally-bonded molding sand.

Most important is the grain distribution of the sand. It should be well distributed over four or five screens. This reduces the penetration of lead-bearing metals and tends to give greater smoothness to casting surfaces. A broader grain spread is also a means to reduce thermal expansion, which in this sand cannot be controlled by heavy additions of combustible material as in the case of steel and iron sands.

One very important property to consider in the selection of sands for molding of brass and aluminum is the amount of grain passing the 140-mesh screen. This should be a minimum of 33 per cent of the total

grains. These materials are classed by the AFS Sand Division as "fines."

The fundamental control of non-ferrous molding sands then lies in the selection of the base sand, its grain distribution, fineness and clay content. Seldom is any stabilizing additive used. If used, it is most often foundry flour which is a wheat flour. Application is sometimes by direct addition to the sand but most often in the form of a mold dust-on powder.

Consider High Temperature

In dealing with the problems of molding sands for steel castings, one must consider the high temperatures encountered. A suitable sand for metal temperatures in the range of 2800 to 3000 F means a synthetic, high-silica sand. Maximum control in all phases of sand practice in the steel foundry is needed. This includes the control and inspection of incoming materials. It taxes the best that sand engineers have to offer today. Steel foundry sand control requires attention to:

1. Sand testing for batch to batch control of such properties as moisture, green and dry strengths, and permeability. Further, the establishment of close control limits is necessary for all these properties.

2. Close control can only be obtained through accurate measurement of binder additions. This means that sands and binders must be weighed. All batches must then be figured on a weight percentage basis.

3. Base sand must be selected carefully in order to obtain a uniform, high-silica sand. Select a sand or sands which blend together to give a distribution of grains over four or five screens.

4. Selection of a uniform source of a strong clay or bentonite which will make possible the use of the minimum amount of the bond for maximum green and dry strengths is important.

5. Steel molding sands are almost entirely synthetically bonded, and western bentonite has proven most acceptable for the bond, resulting in a sand which always has high thermal expansion. Control of this expansion is absolutely essential in good steel practice. In years past this was done by the use of very coarse sands on which permeabilities of 300 were not uncommon and average grain sizes were in the 30's. Modern control of sand thermal expansion has enabled the use of much finer sands with improvement of finish and casting quality. The control of sand expansion is now almost always accomplished entirely by the use of cereal flour, corn flour being the most widely accepted type of material.

The main factors to consider in control of steel sands are dirt and metal penetration. The dirt results from non-uniform thermal expansion of the mold or core surfaces, and the metal penetration results from high metal fluidity and low rammed density or lack of hardness in molds and cores. Control of dirt from sand expansion can best be obtained through close control of physical properties and ample use of stabilizing elements like cereal flour. Much closer control over sand expansion is possible if dilatometer equipment is employed for testing at elevated temperatures.

Control of metal penetration is obtained through control of casting temperature of the metal, and control of the blends of sands so as to obtain the maximum rammed density. Some steel foundrymen prefer to use the heavy zircon sands instead of blending siliceous materials to obtain the needed sand density. By control of sands to obtain a broad grain distribution and use of silica flour, ample density also can be developed to control penetration.

Dilatometer equipment used to determine hot strength and expansion properties of core and molding sands. Sand Control supervisor has just completed high temperature strength test and is viewing specimen for type of break, which, in this sand, was plastic.—Photo courtesy Texas Electric Steel Casting Co.

Increase Wash Penetration

Another way to control metal penetration is to increase the penetration of the silica or carbon mold wash into the surface of molds and cores. To obtain maximum protection, first stabilize the sand against spalling and cracking, then use a wash with ample wetting power to penetrate to a depth of at least 3/64 in. This is absolutely essential to build up surface density and produce heavy steel castings with a minimum of penetration and dirt defects.

The fundamental control of steel molding sands then becomes the control of (1) all properties which have any bearing upon thermal expansion, which is a direct cause of dirt defects, and (2) density of the mold or mold surface materials, for the reduction of metal penetration in casting pockets.

How far should you go in core sand control?

The base core sand need only be a clean sand which is low in natural clay substance. The grain size should be in the range desired for the work in the shop. A washed sand which has been classified from the bank run for uniformity and dried to eliminate the moisture variable is most desirable. The core sand or sands need not be 99.44 per cent pure silica; in fact a small amount of clay (less than one per cent) is both permissible and desirable as this greatly reduces the amount of cereal binder needed and reduces sagging.

Second in importance is the core oil. One cannot judge a core oil by any means such as sight, smell, nor touch. Nor is price a true indication of core oil quality. The author has developed a test which he feels best tells the quality of a core oil. The test is performed by baking out a sand-oil-water mixture, containing one per cent oil and three per cent moisture by weight. This is baked in the form of 3¼ in. cube cores on a solid plate at 425 F for a time found necessary to bake out the cube core bonded with raw linseed oil. The cores are removed from the oven and cooled half an hour on the solid drier plate.

These large rotary sand dryers with combined capacity of 150 tons of dry sand per hour operate on fully automatic controls. Dried sand is subsequently run through dry classifier to assure desired grain distribution characteristics for high quality core production.—Photo courtesy Nugent Sand Co.

View of type of screening room used for the dry classification of foundry core sands. This method assures the accuracy of the final core sand grain distribution, which reflects importantly in the final core's smoothness. Although nature has provided a uniform supply of raw sand at this source, this type of equipment allows the manufacture of a still more uniform product.—Photo courtesy Nugent Sand Co.

Each cube is then weighed and the soft or unbaked center is removed to the hard shell. The shell is again weighed and the percentage of baked portion calculated. This gives per cent bakability of an oil based on raw linseed oil as the standard.

The arbitrary acceptable limit for core oil bakability is 90 per cent. Not only is baking time extended with the incomplete-baking oils but often the unbaked oils and moisture which is retained by them work their way to the surface of the cores in storage. This could cause real trouble from scabbing and veining.

Third in importance are the cereal binders for green strength. Cereal binders are all similar, as most of them today are processed corn flour. They vary greatly in density. A recent study showed they varied from 12 lb to 36 lb per cubic foot. When measuring by volume it is possible to get a 300 per cent variation. Cereal binders and all core binders should be added on a weight measurement basis.

Cereals Cause Gas

Cereal binders are a source of much core gas, being second only to unbaked core oil. Core gas troubles have been known to be greatest when the amount of cereal binder exceeds 1¼ per cent, by weight, of the mixture. In cases where cereal is in excess of 1¼ per cent it is well to use some form of clay to supplement the cereal for green strength, as this reduces the gas-forming materials and gives less sagging. A 0.2 per cent addition of western bentonite will more than double the sagging resistance of a core sand.

One common error is failure to control core sand mixing time. Too short a mixing time makes for the use of excess binders, and increased core gas due to them. Excess mixing wastes time. This has no relation to the type of mixing equipment in use. However, each mixer should be checked to determine the optimum mixing time, taking into consideration the demand for sand, binder cost, baking time, and core gas problems. The correct mixing time is easily determined by removing samples at definite intervals and measuring green compressive strength and resistance to jolting. Mixing time beyond which there is no improvement in green properties is preferable if all other factors are equal. If excessive toughness is developed in the core sand by mixing the optimum time, either cereal or water or both are in excess.

Synthetic resins are strong binders which bake rapidly and completely. Their main drawback is their stickiness, but when used with a good release agent they work as well as core oils. They bake fast and at a lower temperature than core oils. Maximum baking temperatures for core oils should be 475 F; for the phenol resins baking temperature should not exceed 450 F; and for the urea resins the temperature should not exceed 410 F. Some foundrymen prefer the powdered resins over the liquid resins because of better workability of the sands.

A number of prepared or premixed binders are

Table 1—Clay Binder to Develop 9 psi Green Strength

Binder	Clay, %
Natural Sand, not mulled	18
Natural Sand, mulled	12
Weak Fireclays and Earthy Clays, not mulled	18
Weak Fireclays and Earthy Clays, mulled	13.5
Pulverized Fireclays (Ohio type), mulled	9
Bentonites, Southern and Western, mulled	6

sold under many trade names. These binders as a class all require working the sands at higher than average moisture contents. They work quite well for large "chunk" type cores.

Of great importance in any core room is the application of binders to control (either to increase or decrease) collapsibility of cores. When collapsibility is decreased, hot strength is increased. The materials which do this are the non-burning materials: clays, bentonites, pitch binders, iron oxide (red), silica flour and fly ash. These develop hot strength when used in any amount. The extent of their use will depend upon the application. For example:

1. Natural clay in the sand or additions of bentonite in amounts as small as 0.1 per cent reduce the collapsibility of cores. They are often used in amounts between 0.1 and 1.0 per cent.

2. Pitch and rosin binders are best when used in combination with clay, generally close to one part pitch or rosin to one part clay. They are used from 0.5 to 3.0 per cent as the condition requires.

3. Iron oxide and silica flour both increase hot strength rapidly. Iron oxide is about 20 times as effective as silica flour on a pure silica sand. While iron oxide only increases hot strength, silica flour increases density as well which tends to reduce metal penetration. Iron oxide is useful in amounts as low as 0.2 per cent; seldom is it used over 2.0 per cent.

4. Fly ash is a blender of materials in the mixture and is an effective sand plasticizer. Amounts from 1.0 to 4.0 per cent are used.

Check for Clay

If more core collapsibility is needed, check the base sands for excess natural clay, iron oxide or fines. The total grains passing through the 200 screen will react much the same way as silica flour additions. If none of the above conditions exist, either reduce the amount of core oil, or select a faster collapsing binder, such as one of the urea resins. Wood flour is a useful agent in cores where high amounts of hot strength forming materials are added. Its action is one of blending these together and of reducing action.

Kerosene or fuel oil for release of sand and for workability should be used sparingly if at all. Kerosene has been found superior to fuel oils. Its use should be limited to no more than 0.2 per cent of the batch weight. Higher amounts do not tend to reduce stickiness further. If core sand is sticky, then look to the oil or the mixing time and order of binder additions. Addition of core oil before water makes for a less sticky sand.

Foundry sand control can be summarized as follows:

1. Have some definite program of sand testing under the supervision of one who has ability to exploit local problems to the betterment of casting quality.

Sand control supervisor examines a 3¼-in. cube core used for evaluating bakability factor of a core oil, after baking in the regular production ovens.—*Photo courtesy Texas Electric Steel Casting Co.*

2. Select basic raw materials to fit local needs. Use a naturally-bonded sand or a synthetic sand, whichever best fits the production methods. With either, select clay binders not only to bond the sand but to control the amount of clay substance in the sands. This is best between 11—14 per cent AFS clay determination.

3. In gray iron and malleable foundries, select the correct grind of seacoal to fit the size of work being made. Use pitch for heavy green sand and dry sand work as extenders of seacoal. For heavy gray iron work use plumbago or carbon blacking to rub in, or spray and dry, for best surface finish. For the control of scabbing, use cereal flour, wood flour, or proprietary cellulose and carbonaceous materials if seacoal and pitch are not adequate to prevent excessive sand expansion.

4. In non-ferrous sands, pay greater attention to selection of the molding sand.

5. In steel foundry molding sand, pay greatest attention to the causes of dirt and metal penetration defects. The proper use of cereal binders for the control of expansion will reduce dirt, with too much binder being as harmful as too little. For the control of metal penetration, high density sands, whether achieved by use of a broad spread of grain and silica flour or by the use of zircon sand, have proved helpful. A mold wash offering greatest penetration is very important.

6. Core sand mixtures are best when made from a washed, dried, and controlled fineness sand. Core oils are judged on their ability to bake thoroughly. Cereal binders are a principal source of core gas and should be added sparingly and on a weight basis. The use of excessive cereal will arise if mixing time is not established. If greater green strength or sag resistance is desired in a core, adjust the cereal to water ratio or supplement the cereal with small quantities of clay or western bentonite. Core hot strength is increased by the use of non-combustible binders and collapsibility is increased by reducing these hot strength-forming materials or by using faster collapsing binders or using less core oil.

News of Technical Committees

Mold Surface Committee

Prof. C. C. Sigerfoos, Michigan State College, headed this meeting, which was held November 18-19, at the Bureau of Mines and Technical Surveys, Ottawa, Canada. An informal meeting was held the first day to prepare core washes to be used in the study of metal penetration of gray iron castings. The work was essentially the same as that performed at Michigan State College, with certain minor changes.

Under the conditions of the tests, it was apparently corroborated that silica flour washes give better protection against metal penetration than do graphite washes.

In the formal meeting on November 19, it was decided to prepare only a progress report at this time. Considerable interest centered around the effects of Baume on metal penetration of gray iron. Further work will be undertaken to determine the optimum Baume of graphite and silica flour washes to prevent metal penetration.

Steel Division

Research Committee. A meeting of this committee was held at the Armour Research Foundation, Chicago, on November 18, with Chairman C. H. Wyman, Burnside Steel Foundry Co., Chicago, presiding.

Principal subject was the recent donation of $12,000 for research by American Steel Foundries, East Chicago, Ind. It was decided to include the effects of deoxidation in the investigation, in addition to a complete metallographic study of steel structure at the rupture and at a cold spot remote from the hot tearing area.

Residuals and other elements will be determined by the Foundation and by the participating companies. Armour will be furnished test castings but will produce no heats in connection with the project.

Soft and hard core sand mixtures will be investigated, with American Steel Foundries supplying all cores for the constant core mix.

Metallographic examinations will show type of structure, inclusion count, and type and mode of crack. Core mixes of individual foundries will be compared with standard core mix from American Steel Foundries by pouring test castings from the same heat. Samples of all mixes will be sent to Harry W. Dietert laboratories for examination of hot strength characteristics.

The new core box equipment was discussed. In all cases, the special cup showed a distinct advantage over production cups with respect to uniformity of pouring rate. The influence of the human element could be largely eliminated and uniform rates attained, with marked improvement in surface quality of finished castings.

Final subject was a brief discussion of the proposed Hot Tear session at the 1954 Convention.

Sand Division

Program and Papers Committee. This committee met in Chicago on December 8, and, under the chairmanship of O. J. Myers, Archer-Daniels-Midland Co., Minneapolis, discussed the Sand Division participation in the 1954 Cleveland Convention. In addition to grouping papers for presentation, officials were appointed for each of the six scheduled sessions.

Two sessions are set for the afternoon of May 12; one in the morning and two in the afternoon on May 13; and a final session on Friday morning, May 14.

It was also agreed that the Division would sponsor a Round Table Luncheon on Tuesday, May 11, at noon. This meeting will be held at the Auditorium Hotel, according to present plans, with a general theme of: "What's In the Future?" Division committee chairmen will also present short reports during the luncheon.

The six technical sessions will each feature definite phases of sand operations in the foundry. The first stresses fundamentals; the second, sand preparation; the third, molding methods; the fourth, cores; the fifth, surface finish; and the last, developments.

Grading, Fineness and Distribution Committee. Two meetings of this committee were held in November, one on the 23rd in Washington, D.C., and the second on November 30 in Chicago, both under chairmanship of C. A. Sanders, American Colloid Co., Chicago.

At the Washington session, T. A. Tarquinio was unanimously elected as Vice-Chairman of the committee. The question, "What is a screen?" was discussed, centering on use of Bureau of Standards glass spheres for screen calibration. The first half of the calibration procedure was promised before December 10 so that a paper could be compiled and be available for the division Program and Papers Committee meeting.

A vigorous discussion followed regarding screen analysis and the use of curves and graphs. Stanton Walker, National Industrial Sand Assn., reported the consensus of his organization's meeting at Greenbriar.

The second meeting of the committee was held in Chicago. After a brief discussion of the Washington session, each member present was asked to define a screen. There was considerable variance with the conclusions of the Washington group. It was finally suggested that a general paper on the subject be presented at Cleveland, but not as an official paper from the committee.

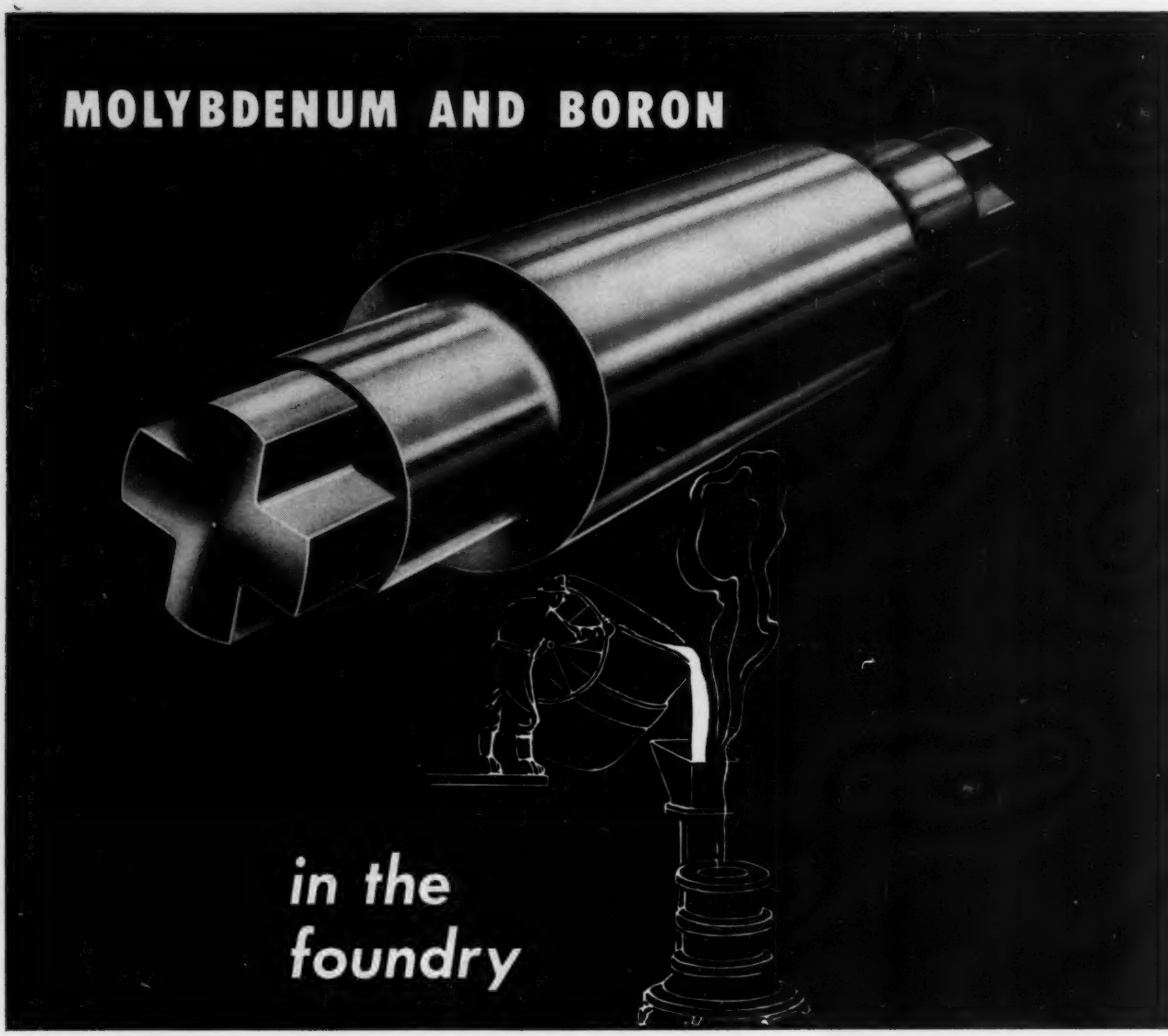
Cupola Research Committee

Chairman Hyman Bornstein, Moline, Ill. opened the meeting at Chicago, November 23, by calling on H. J. Heine, AFS Acting Technical Director, who thanked the members for their untiring efforts. Chairman Bornstein briefly reviewed the work of the Editorial Subcommittee and discussed the status of the various chapters.

The members present agreed that the melting of non-ferrous materials in the cupola need not be covered in the new book, since this practice is used very little and has become a specialty.

A tentative schedule called for a final meeting of the subcommittee in January, and publication of the revised handbook in time for the Cleveland Convention.

S. L. Gertsman, Canadian Bureau of Mines, Ottawa, Can., points out penetration test mold details to Prof. C. C. Sigerfoos, chairman, Mold Surface Committee, during Canadian visit.



Rolls are among many cast, wrought iron and steel products that have been improved by Molybdenum and Boron. Very small additions, properly introduced, yield surprising results. MCA Molybdenum additions increase the resistance of rolls to breakage, chipping, heat checking and spalling in service. Molybdenum and Boron improve toughness and hardness qualities at both room and higher temperatures.

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Test your foundry knowledge with "The Foundry Quizmaster." Your reward for taking the quiz: Increased knowledge of foundry practice. Questions this month deal entirely with definitions of foundry terms. They are based on the recently published *AFS Glossary of Foundry Terms.* Answers will be found on page 99.

1. Abrasives . . Materials for grinding, polishing, blasting, etc., either in loose form or bonded to form wheels, bricks, and files, or applied to paper and cloth by means of glue or resins. True___. False___.

2. Blocked Heat . . Interrupted heat in which furnace goes off due to power failure. True___. False___.

3. Cheek . . Extra section welded into ladle to permit pouring larger castings. True___. False___.

4. Chinese Script . . Term used to describe surface appearance of coated pattern left in sand too long. True___. False___.

5. Drawback . . Section of mold lifted away on a plate or arbor to facilitate removal of the pattern. True___. False ___.

6. Exothermic Reaction . . Chemical reactions involving the liberation of heat, such as burning of fuel and deoxidizing of iron with aluminum. A characteristic of many feeder or riser compounds. True___. False___.

7. Flux . . A material or mixture of materials which causes other compounds with which it comes in contact to fuse at a temperature lower than their normal fusion temperature. True___. False___.

8. Grain Refiner . . Wood pattern prime coat which makes grain smaller. True___. False___.

9. Heart and Square . . Trade mark of first foundry in America established in Saugus, Mass., in colonial days. True ___. False___.

10. Inverse Chill . . The condition in a casting section where the interior is mottled or white while the outer sections are gray iron. True___. False___.

11. Jack Star . . A piece of hard metal for use in a tumbling barrel for casting cleaning purposes. True___. False___.

12. Keel Block . . The standard test specimen for steel and other relatively high-shrinkage alloys. True___. False ___.

13. Layout Board . . Platform for laying out cores for floor molding job. True___. False___.

14. Misrun . . Mold accidentally poured through riser instead of sprue. True___. False___.

15. Ounce Metal . . A copper-base casting alloy of unknown origin containing 85 per cent copper and five per cent each of tin, lead, and zinc. True___. False___.

16. Proof Stress . . That stress which will cause a specified permanent deformation in a material, usually 0.01 per cent or less. True___. False___.

17. Quenching Crack . . A fracture resulting from thermal stresses induced during rapid cooling or quenching, or from stresses induced by delayed transformation some time after the article has been fully quenched. True___. False___.

18. Relief Sprue . . Substitute sprue for used in case molder forgets to cut gate for pouring sprue. True___. False ___.

19. Sharp Sand . . Highly angular sand used in molding where maximum flowability of sand mixture is not required. True___. False___.

20. Standard Pattern . . A pattern of high-grade material and workmanship in daily use or used at frequent intervals. A pattern used as a master to make or check production patterns. True___. False___.

21. Tin Sweat . . Beads of molten tin that form on a piece of tin left to preheat on furnace cover. True___. False ___.

22. Umbrella Core . . A core used in either cope or drag to form an internal or external surface and one face of the casting. True___. False___.

23. Vitrification . . Transformation of a refractory material into a glassy substance, by heat and fusion; to make or become vitreous. True___. False___.

24. Washburn Core . . Thin core used to stop off mold cavity. Permits single pattern to be used for several sizes of castings. True___. False___.

25. Yield Point . . The load per unit of original cross-section at which a marked increase in deformation occurs without increase in load. True___. False___.

A.S.M. Sponsors New Teacher Training Course

A NATIONWIDE training program for teachers in the vocational and skilled trades has been implemented by American Society for Metals.

The program is designed to upgrade students in these schools by adding to the curricula of their studies a course in metal technology.

W. H. Eisenman, A.S.M. national secretary, reports that the program is well under way, having been successfully carried out in New York, Massachusetts, and California.

The program does not attempt to teach metallurgy, but, instead, to introduce the subject of metals technology into courses covering welding, machining, drafting, and other allied trades which involve metals. The society works on the premise that vocational and trade school teachers are well equipped to add metals technology to their teaching efforts, an assumption that has proved sound.

A.S.M. provides the teaching personnel for the training courses and has prepared text material for both the teacher training and for student use. The program is expected to fill a definite need in the preparation of trade students for industry.

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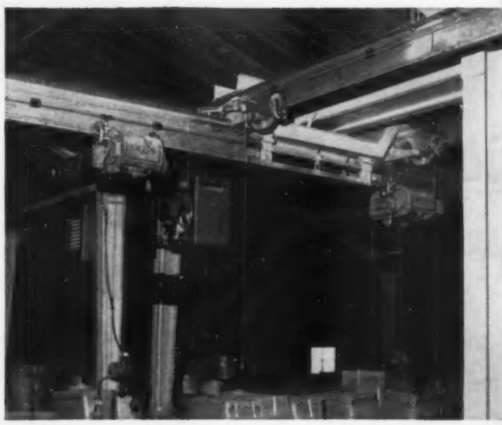
AMERICAN MONORAIL CRANES

Three-ton hoist hook service extends from craneway to craneway by finger-tip controlled passage of carrier across crossover with cranes interlocked at each end.



One-ton hoist operated from crane bridge to crane bridge interlocked at crossover between craneways.

Three MonoRail cranes are interlocked to form passageway for transfer from receiving dock to steel storage area. Crane in foreground interlocks with spur track to each shear.

To handle variable loads over maximum areas, MonoRail Cranes offer smooth travel, easy movement, interlocking service between and beyond craneways, low initial cost and most important low maintenance cost. American MonoRail engineers are experienced in all phases of "up and over" handling. They are available for free consultation at your convenience.

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OVERHEAD HANDLING EQUIPMENT

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Ashley B. Sinnett (left) of Michigan State College staff points out some of opportunities in metals casting. (Right) Exhibit included a carnival wheel and typical castings.

Annual Career Carnival Held at Michigan State

MICHIGAN State College recently staged its annual two-day Career Carnival, intended to aid the school's engineering and technical students in orienting their post-graduate careers in industry.

Through this annual activity, students on the East Lansing campus are able to meet and talk with representatives of the various industries interested in recruiting college graduates.

The 1953 Carnival attracted a total of 85 individual organizations, representing many industrial activities. However, only the foundry industry was represented on an overall basis. The remaining 84 booths were sponsored by specific companies rather than by industrial groups.

The show lasted for two days and evenings, with approximately 11,000 persons attending. The visitors were largely comprised of college students, high school seniors, and teachers and instructors of both secondary and college levels.

Spring Planning

Planning for the Carnival was begun in the spring of 1953. Participating groups were the advisory committee of Foundry Educational Foundation and the four Michigan chapters of American Foundrymen's Society: Detroit, Saginaw Valley, Central Michigan, and Western Michigan. The latter groups also aided in the financial support of the show.

The foundry industry booth was designed in keeping with the carnival spirit of the show. It was intended to point out to the students the importance, functions, and broad opportunities existing within the industry. Students of the Michigan State AFS Student Chapter constructed the display, under the guidance of Robert D. Dodge, Archer-Daniels-Midland Co.; Prof. Charles C. Sigerfoos of M.S.C.; Bruce Harding, Chairman of the Student Chapter; and Claridon Thomas, Vice-Chairman of the student organization.

In full view of all entrances to the display area were the flashing lights of the carnival wheel, which was constructed by Ernie Frens, and which listed the various job opportunities open to graduates in the metals casting industry. A large question mark asking: "Where do you fit in the cast metals industry?" was displayed in the corner of the booth and extended to the ceiling.

Area Break-down

The display was designed to present a break-down of the various areas of employment so the individual might anticipate where he might fit in the field.

The cast metals pyramid was used again this year, emphasizing that the industry is basic to the economy. In addition, a lighted world globe was used, with streamers leading to the various basic categories of the foundry industry. In the base of the pyramid a slide projector showed a sequence of molding, pouring and cleaning a casting. The slides were provided by Michigan State College, F.E.F., and Kenneth E. Priestley, Vassar Electroloy Products, Vassar, Mich.

F.E.F. was represented at the Carnival by Charles Esgar. He distributed foundation literature among interested students. Many students were given a new perspective on the educational opportunities available to them during their under-graduate studies.

One of the highlights of the Carnival was the presentation of a $2000 check to Jack Smith, chairman, F.E.F. advisory board. Mr. Dodge made the presentation for his company, Archer-Daniels-Midland.

Other foundry industry representatives present at the Carnival included: Jess Toth, Harry W. Dietert Co., Detroit; Robert Pierce, Chevrolet Gray Iron Div., Saginaw Mich.; and R. T. Peters, Eaton Mfg. Co., Vassar, Mich.

Casting Publication Ready

NOW available from the Library of Congress, Washington 25, D. C., is a new publication: Advanced Casting Techniques and Processes, consisting of 147 pages, with photographs and blueprints. It was prepared by Alloy Engineering and Casting Co. for the Navy Department's Bureau of Ships and Bureau of Aeronautics.

The publication reports on development work in the casting of high temperature alloys in ceramic molds to conserve material and manpower. The several types of special equipment developed for the centripetal casting process are described and illustrated. The report contains descriptions of new equipment and methods for conserving materials, reducing rejects, and producing more accurate workpieces. Refer to code number PB 109239.

Classification of Cast Copper-Base Alloys

(Reprinted from *Copper-Base Alloys Foundry Practices*, second edition (1952) published by American Foundrymen's Society)

In 1945 the American Society for Testing Materials, in an effort to classify the vast number of copper-base alloys made in the United States and Canada and to satisfy a demand on the part of both producers and consumers, issued a *Classification of Copper-Base Alloys, B119-45,* which from 1939 to 1945 was a tentative standard.

The classification, together with the basis for it, follows.

1. Scope

a) This classification of the different types of cast copper-base alloys is intended to simplify the terminology applied to these alloys. For casting purposes copper is used unalloyed and as alloyed with from one to many different added elements. The actual number of alloys in use is legion. Each of the classes shown generally covers many alloys.

b) This classification is not intended as a specification. Where specifications for an alloy within a particular class are available references to such specifications are indicated in the column under "Remarks." The complete designations and titles of these specifications are given in the "Explanatory Note" at the end of this classification.

2. Basis of Classification

For purposes of this classification the term "copper" shall mean all alloys containing 98 per cent or more of copper; the term "brass" shall mean all copper-base alloys containing an appreciable amount of zinc; and the term "bronze" shall mean all copper-base alloys containing alloying elements other than zinc and in sufficient amounts to be predominant over the zinc in the alloy.*

*A more exact definition of the term "brass" is copper-base alloys of copper (less than 98 per cent) and zinc. These alloys may be modified by additions of other elements in such small quantities that their effect on properties is subordinate to that of zinc.

Class	Addition Elements	Remarks
	COPPER	
Copper	Not over 2 per cent total of arsenic, zinc, cadmium, silicon chromium, silver or other elements.	Conductivity copper castings, pure copper, deoxidized copper and slightly alloyed copper.
	BRASSES	
Red Brass	2-8 per cent zinc. Tin less than zinc. Lead less than 0.5 per cent.	Alloys in this class without lead seldom used in foundry work.
Leaded Red Brass	2-8 per cent zinc. Tin less than 6 per cent, usually less than zinc. Lead over 0.5 per cent.	Commonly used foundry alloys. May be further modified by addition of nickel. See ASTM Specifications B62 and B145.
Semi-Red Brass	8-17 per cent zinc. Tin less than 6 per cent. Lead less than 0.5 per cent.	Alloys in this class without lead seldom used in foundry work.
Leaded Semi-Red Brass	8-17 per cent zinc. Tin less than 6 per cent. Lead over 0.5 per cent.	Commonly used foundry alloys. May be further modified by addition of nickel. See ASTM Specification B145.
Yellow Brass	Over 17 per cent zinc. Tin less than 6 per cent. Under 2 per cent total aluminum, manganese, nickel, iron or silicon. Lead less than 0.5 pct.	Commonly used foundry alloy.
Leaded Yellow Brass	Over 17 per cent zinc. Tin less than 6 per cent. Under 2 per cent total aluminum, manganese, nickel or iron. Lead over 0.5 per cent.	Commonly used foundry alloy. See ASTM Specification B146.
High Strength Yellow Brass (Manganese Bronze)	Over 17 per cent zinc. Over 2 per cent total of aluminum, manganese, tin, nickel and iron. Silicon under 0.5 per cent. Lead under 0.5 per cent. Tin less than 6 per cent.	Commonly used foundry alloys under the name of "manganese bronze" and various trade names. See ASTM Specification B147.
Leaded High-Strength Yellow Brass (Leaded Manganese Bronze)	Over 17 per cent zinc. Over 2 per cent total of aluminum, manganese, tin, nickel, and iron. Lead over 0.5 per cent. Tin less than 6 per cent.	Commonly used foundry alloys. See ASTM Specifications B132 and B147.

Foundry Facts

Copper-Base Alloys

Class	Addition Elements BRONZES (continued)	Remarks
Silicon Brass	Over 0.5 per cent silicon. Over 5 per cent.	Commonly used foundry alloys. See ASTM Specification B198.
Tin Brass	Over 6 per cent tin. Zinc more than tin.	Alloys in this class seldom used in foundry work.
Tin-Nickel Brass	Over 6 per cent tin. Over 4 per cent nickel. Zinc more than tin.	Alloys in this class seldom used in foundry work.
Nickel Brass (Nickel Silver)	Over 10 per cent zinc. Nickel in amounts to give white color. Lead under 0.5 per cent.	Commonly used foundry alloys, sometimes called "German silver."
Leaded Nickel Brass (Leaded Nickel Silver)	Over 10 per cent zinc. Nickel in amounts sufficient to give white color. Lead over 0.5 per cent.	Commonly used foundry alloys, sometimes called "German silver." See ASTM Specification B149.

BRONZES

Class	Addition Elements	Remarks
Tin Bronze	2-20 per cent tin. Zinc less than tin. Lead less than 0.5 per cent.	Commonly used foundry alloys. May be further modified by addition of some nickel or phosphorus or both. See ASTM Specifications B22 and B143.
Leaded Tin Bronze	Up to 20 per cent tin. Zinc less than tin. Lead over 0.5 per cent, under 6 per cent.	Commonly used foundry alloys. May be further modified by addition of some nickel or phosphorus or both. See ASTM Specifications B61 and B143.
High-Leaded Tin Bronze	Up to 20 per cent tin. Zinc less than tin. Lead over 6 per cent.	Commonly used foundry alloys. May be further modified by addition of some nickel or phosphorus or both. See ASTM Specifications B22, B66, B67 and B144.
Lead Bronze	Lead over 30 per cent. Zinc less than tin. Tin under 10 per cent.	Used for special bearing applications.
Nickel Bronze	Over 10 per cent nickel. Zinc less than nickel. Under 10 per cent tin. Lead under 0.5 per cent.	Commonly used foundry alloys. Sometimes called "German silver" or "nickel silver."
Leaded Nickel Bronze	Over 10 per cent nickel. Zinc less than nickel. Under 10	Commonly used foundry alloys. Sometimes called "Ger-

Class	Addition Elements BRASSES (continued)	Remarks
	per cent tin. Lead over 0.5 per cent.	man silver" or "nickel silver." See ASTM Specifications B149.
Aluminum Bronze	5-15 per cent aluminum. Up to 10 per cent iron, with or without manganese or nickel. Less than 0.5 per cent silicon.	Commonly used foundry alloys. Some may be heat-treated. May be further modified by addition of some nickel or tin, or both. See ASTM Specifications B148.
Silicon Bronze	Over 0.5 per cent silicon. Not over 5 per cent zinc. Not over 98 per cent copper.	Commonly used foundry alloys. Some are readily heat-treated. See ASTM Specifications B198.
Beryllium Bronze	Over 2 per cent beryllium or beryllium plus metals other than copper.	Most of these alloys are heat-treatable.

The specifications indicated in the column under "Remarks" refer to the following specifications of the American Society for Testing Materials for sand catsing of these alloys. Specifications for ingots for many of these alloys will be found in the Standard Specifications for Copper-Base Alloys in Ingot Form for Sand Castings (ASTM Designation: B30-49).

ASTM Designations and Specifications

B 22-52	Bronze castings for Turntable and Movable Bridges and for Bearings and Expansion Plates of Fixed Bridges.
B 61-52	Steam or Valve Bronze Castings.
B 62-52	Composition Brass or Ounce Metal Castings.
B 66-52	Bronze Castings in the Rough for Locomotive Wearing Parts.
B 67-52	Car and Tender Journal Bearings, Lined.
B132-52	Leaded High-Strength Yellow Brass (Manganese Bronze) Sand Castings.
B143-52	Tin Bronze and Leaded Tin Bronze Sand Castings.
B144-52	High-Leaded Tin Bronze Sand Castings.
B145-52	Leaded Red Brass and Leaded Semi-Red Brass Sand Castings.
B146-52	Leaded Yellow Brass Sand Castings for General Purposes.
B147-52	High-Strength Yellow Brass (Manganese Bronze) and Leaded High-Strength Yellow Brass (Leaded Manganese Bronze) Sand Castings.
B148-52	Aluminum Bronze Sand Castings.
B149-52	Leaded Nickel Brass (Leaded Nickel Silver) and Leaded Nickel Bronze (Leaded Nickel Silver) Sand Castings.
B198-52	Silicon Bronze and Silicon Brass Sand Castings.

In conference at the recent Whiting Corp. reception in New York are left to right: W. C. Mulligan, Whiting Corp.; Stevens H. Hammond, Whiting's chairman of the board; Frederick M. Gillies, president of Acme Steel Co. and a Whiting director, and Col. Roy B. White, chairman of board of B & O RR. Whiting directors held their board meeting in New York followed by an informal get-together at the Barclay Hotel for 250 industrialists of the New York Area.

Foundry Tradenews

Stainless Foundry & Engineering Co., Milwaukee, has purchased the assets of the Illium Corp., Freeport, Ill. Operations have been transferred to the Stainless Foundry plant.

Cleveland Vibrator Co., Cleveland, has appointed **Industrial Vibrator and Machinery Co.**, San Francisco, Cal., as its West Coast distributor.

Eastern Foundry Supplies, Inc., Newark, N. J., under a new exclusive license, will manufacture and sell "Foundrate" fluxes. American-British Chemical Supplies, Inc., manufactured the fluxes for many years. During recent years Eastern Foundry has handled sales on an exclusive basis.

Arthur D. Little, Inc., Cambridge, Mass., will open a western regional office in San Francisco, Cal. Christian J. Matthew, of the Cambridge office, will be in charge and Richard Newhall will be his associate.

Northwestern Stove Repair Co. and Greenlee Foundry Co. were merged recently under the name of **Greenlee Foundries, Inc.**, Chicago. Operations will continue as usual at Greenlee Foundry Co. and Northwestern Stove Repair Co., both of Chicago, and Southern Illinois Foundry Co., Carmi, Ill.

Control of the Ductile Iron Foundry, Inc., Stratford, Conn., has been acquired by the **Hartford Electric Steel Co.**, Hartford, Conn. Over $60,000 is being spent to install new pit type annealing furnaces, cleaning and inspection facilities and control devices.

"Whirl-Air-Flow," a pipeline pneumatic conveyor system for moving foundry sand, will be handled by **Rajac Equipment Sales Corp.**, Chicago, in the midwest states.

Houston Foundry & Machine Co., has purchased the machinery and equipment of Industrial Foundry Corp. Marvin W. Williams, president of Industrial Foundry, has joined the firm of Houston Foundry.

Lasalle Coke Co., has moved its sales office to its new building at 435 St. Patrick St., Ville LaSalle, P.Q., Canada. Mailing address will be: P.O. Box 600, Montreal, P.Q.

Commemorating its 60th year as producers of ferrous castings and a recent expansion of its steel foundry, **Belle City Malleable Iron Co.** and **Racine Steel Castings Co.**, Racine, Wis., has published a booklet, "Ladle and Mold," which is available upon request. Booklet contains photographs of modern foundry equipment, and reference work on ferrous castings, the properties of the different types, and the methods by which they are produced.

Mackintosh-Hemphill Co., Pittsburgh, Pa., plans a quarter-million-dollar expansion program for its Midland, Pa., foundry. New equipment being acquired for the plant includes an Ingersoll vertical milling machine.

Lemmon Elected

Floyd O. Lemmon, Ohio Steel Foundry Co., Springfield, Ohio, has been elected chairman of the Electric Furnace Steel Committee of the American Institute of Mining and Metallurgical Engineers. The election was announced at the Eleventh Annual Electric Furnace Steel Conference, held at the Netherland Plaza Hotel, Cincinnati, Ohio, December 2-4.

H. F. Walther, Timken Roller Bearing Co., Canton, Ohio, and Clarence E. Sims, Battelle Memorial Institute, Columbus, Ohio, were elected chairman and vice-chairman, respectively, of the committee for the twelfth conference, to be held at Hotel William Penn, Pittsburgh, Pa., December 1-4, 1954. W. M. Farnsworth, Republic Steel Corp., Massillon, Ohio, and Ray H. Frank, Bonney-Floyd Co., Columbus, Ohio, were presented life memberships and certificates of award in recognition of their services to the conferences.

Correction

In the article on riser range and feeding adequacy by William S. Pellini, AMERICAN FOUNDRYMAN, November 1953, pp. 58-66, and December 1953, pp. 62-71, the following corrections apply:

November, p. 62, Table 1—Plate thickness formula is T/2 not T/4.

December, p. 62, last paragraph, line 4—feeding distance is 4½T for 1-in. (not 2-in.) thick sections.

The latter correction also applies to the same location, page 70, TRANSACTIONS AFS, vol. 61, 1953.

Employees of Hamilton Foundry & Machine Co. receiving bags of silver dollars plus food baskets and hams at the annual Christmas party. From left to right; William Sandlin and Boyd Croucher, molders; Peter E. Rentschler, president of Hamilton Foundry, and Santa Claus, played by Peter R. Rentschler, son of the president.

Guest speaker Tom Barlow, Eastern Clay Products Co., Chicago, third from right, talks things over after the December meeting of the Western Michigan Chapter.

Chapter News

Still 608 To Go

Membership in the American Foundrymen's Society as of December 31, 1953, was 11,392. This is an increase of 26 new members over the previous month but still leaves a total of 608 new members needed to meet our target of 12,000 members by June 30, 1954. With the holidays over, now is the time to get behind the membership chairman and get the new members to meet your target. During December three new company members have been added to the rolls. They are:

Company Members

***Fallon Industries, Inc.*, Detroit; Albin F. Fallon, Pres. (Detroit Chapter). Conversion from Personal.**

***Hub City Iron Co.*, Aberdeen, S. D.; P. C. Green, Pres. (Twin City Chapter.)**

***Plastics Engineering Co.*, Sheboygan, Wis.; K. H. Brockschmidt, Chem. Engr. (Wisconsin Chapter).**

Central Michigan

The position of Secretary-Treasurer of the Central Michigan Chapter has been transferred to Gardner Lloyd, Albion Malleable Iron Co., Albion, Mich. He replaces Gerald D. Strong, Homer Foundry Corp., Coldwater, Mich.

Central Indiana

Over 140 members and guests of the Central Indiana Chapter attended the December meeting to hear Ted Glaza, Crane Co., discuss "Sand System Maintenance." J. W. Ratcliff, Perfect Circle Corp., was technical chairman. Mr. Glaza covered the more common problems consistent with operation of a sand system. He used slides to illustrate some of the more pertinent points. The importance of "housekeeping" and adequate engineering in producing better maintenance was stressed. Mr. Glaza gave credit to Harold Record, National Malleable & Steel Castings Co., for organizing a group of 14 maintenance men in the Chicago area, to discuss maintenance problems.

During the business session one of the guests, Ernest R. Thiel, supervisor of vocational education in the Indianapolis Public Schools, briefly outlined some of the work being done by the Foundry Educational Committee. The Committee announced a special AFS Training Course on Fundamentals of Foundry Safety to be held March 23-24 at the Union Building, Butler University, Indianapolis. There will be approximately 14 hours of instruction. —*William H. Faust.*

Northwestern Pennsylvania

The November meeting of the Northwestern Pennsylvania Chapter was held in the Blue Room of the Erie Moose Club, Erie, Pa., and Bailey D. Herrington, Hickman-Williams & Co., officiated in the absence of Chairman Charles F. Gottschalk, Cascade Foundry Co., National Director H. G. Robertson, American Steel Foundries, Alliance, Ohio, was introduced and he informed the membership that ground had been broken for the Society's new home in Des Plaines, Ill. He also complimented the Chapter for having reached its quota of new members for the current year. Mr. Harrington introduced the guest speaker for the evening J. A. Gitzen, president of Delta Oil Products Co. of Wisconsin, who's subject was "Cores and Core Sand Binders." —*Roy A. Loder.*

Saginaw Valley Chapter

The Saginaw Valley Chapter featured a panel discussion on Safety, Hygiene, and Air Pollution at its December meeting at Frankenmuth. The members of the panel were William N. Davis, director, Safety, Hygiene, and Air Pollution Program of AFS; Herbert T. Walworth, director of Industrial Hygiene, Lumbermen's Mutual Casualty Co.; and John Kane, manager, Dust Control Div. of American Air Filter Co. The speakers were introduced by Vice-Chairman Woodrow W. Holden, Eaton Manufacturing Co. Mr. Davis gave a brief history of what the AFS committees have done, are doing at present, and listed some of the projects that are being planned for the future. He stressed the point that every foundryman as an individual must assume more responsibility for accident prevention and health problems. Mr. Walworth described the foundry as a changing mechanism which creates health problems and pointed out various materials and operations that are very hazardous to health unless special precautions are taken. Mr. Kane discussed the air pollution problems that confront many foundries. His remarks pertained to the emissions of dust and fumes of the outside atmosphere and cautioned that visibility is not always a good measure of the problem. *Roy S. Dahmer.*

Ontario Chapter

More than 200 Ontario Chapter members and interested foundrymen visited the Steel Co. of Canada, Hamilton Works, December 11. The tour of the huge plant started inside the big main gate and the first stop was to view from the ground the four blast furnaces. Next stop was a close up view of the coke ovens where coal is reduced to coke used to feed the blast furnaces. The tour, which covered about

Attending Texas Chapter Sectional Chairman meeting in December are from left to right: Elmore C. Brown, secretary; Charles Winterborne, San Antonio Section chairman; H. F. Bolman, Houston Section chairman; Marvin W. Williams, Houston Section chairman; Israel Smith, Texas Chapter chairman; Edward W. Pruske, San Antonio Section chairman; John Warner, East Texas Section chairman, J. O. Klein, AFS National Director, and Edward W. Wey, chapter vice-chairman.

half of the plant, took three hours after which supper was served by Stelco., in its cafeteria. A colored film, "Steel for Canadians", was shown by Mr. Carey of Stelco following the supper. —*C. E. Maddick.*

Twin City

The annual Christmas party, attended by approximately 400 persons, highlighted the December activities of the Twin City Chapter. Leo Malis, Crown Iron Works, was chairman of the committee which arranged the affair at the Nicollet Hotel, Minneapolis.

November 23-24 were dates for the Institute Foundry Safety and Hygiene presented at the University of Minnesota's Center for Continuation Study. The institute was offered through the facilities of the University's College of Engineering and Center for Continuation Study in cooperation with the Twin City Chapter and National Headquarters of the AFS.

The Twin City Chapter has issued a 1953-54 program and roster listing officers, directors, past chairmen, committees, monthly programs, and roster of members and companies represented. —*R. J. Mulligan.*

Northeastern Ohio

Northeastern Ohio Chapter forsook its usual technical meeting in November in order to make a tour of the Ford Cleveland Foundry. The event was sponsored by the patternmakers' division of the chapter, and attendance was limited to 400 members. The tour was preceded by a dinner in the plant cafeteria; proceeds aggregated over $1000 and were donated by the Ford Motor Co. to the chapter for its educational fund. Members made the tour in groups of about 20, each guided by a Ford representative. The company also provided each tourist with a pair of safety glasses to wear in the foundry.

The Pattern Manufacturers Group of the Associated Industries of Cleveland and the Northeastern Ohio Chapter announced the opening of local apprentice contests in Wood and Metal Patternmaking and Gray Iron, Non-Ferrous and Steel Molding Divisions. Prizes will be awarded and winners of this contest will be entered in the international contest of AFS.—*Jack C. Miske.*

Metropolitan

The Metropolitan Chapter has announced the opening of its 1954 Molders and Pattern Makers Apprenticeship Contest. There are five divisions in which prizes will be awarded: Metal and Wood Patternmaking; Gray Iron; Steel and Non-Ferrous Molding. All men serving apprenticeships of not less than three years duration and recent employees working less than three years in the foundry industry are eligible. Men under 24 years of age or time spent in the armed forces plus 24 years will be eligible for the national as well as the local contest.

Head table at the Christmas meeting of the St. Louis Chapter are front row left to right: Mrs. Nancy Vigne, Fred Boeneker, Warner B. Bishop, guest speaker; Webb L. Kammerer, chairman; Dale Arnette, W. A. Zeis; back row left to right: C. E. Coulter, P. E Retzlaff and John O'Meara.

Michigan State College

The first Fall-Term meeting of the Michigan State College Student Chapter was held in the College Union Building in October. Those present included new Chapter industrial advisors Kenneth Priestley, Vassar Electroloy, Vassar, Mich. and Dr. F. Rote, Albion Malleable Iron Co., Albion, Mich.

In a short talk to the students, Dr. Rote outlined the opportunities the cast metals field offered young men. He cautioned, however, that young men often become impatient for advancement before allowing time to develop complete familiarity with production problems and technique.

Mr. Priestley, in addressing the group, gave a short resume of his own early foundry experience and emphasized the importance of technical knowledge, practical experience, and hardwork to success in any field. Mr. Priestley concluded by showing slides he had taken of operations at the Vassar Electroloy Products Company.

Following the advisors remarks, plans were formulated for a field trip to the Eaton Manufacturing Co., Vassar, Mich. to include participation at the regular evening meeting of the Saginaw Valley Chapter at Frankenmuth.

—*Thomas G. Thomas.*

From left to right at the Philadelphia Chapter meeting are: George Bradshaw, Panel member on Brass and Bronzes; Clyde Jenni, Technical Chairman for the entire session; J. L. Stevens, Bethlehem Steel Co., Speaker of the evening; Albert J. Saute, Panel member on Iron; and Charles R. Sweeny, Panel member on Steel. Photo courtesy of Leo Houser, Dodge Steel Co.

Western New York

Members and guests of the Western New York Chapter met at the Sheraton Hotel, Buffalo, N. Y., December 4, to hear Frank G. Steinebach, Editor of *Foundry* Magazine, speak on "Progress in Castings." Going back 50 years and covering the progress of the foundry industry from crude equipment to the present mechanized equipment and methods for quality control, Mr. Steinebach painted a bright future for the foundry. In closing he warned that the industry must keep alert to the great advancement in machine production; automatic molding machines, quality control, research, and the possibilities of pressure molding, research on which, is going on at the present time.—*Roger E. Walsh.*

Oregon

Oregon Chapter Membership Chairman, Henry Ernstrom, J. E. Haseltine & Co., has found it necessary to resign because of business reasons. James T. Dorigan, Chapter Chairman has appointed Harry McAllister, Western Foundry Co. to serve out the rest of the year.

Chesapeake

The November meeting of the Chesapeake Chapter was held in the form of a round table discussion with C. A. Robeck, Gibson & Kirk Co., Baltimore, Md., spokesman for the Non-Ferrous Group; Eugene H. Ryer, James J. Lacy Co., for Gray Iron; and Harold Bishop, U. S. Naval Research Laboratory, for Steel. The meeting was conducted as a question and answer panel. The discussion covered a varied number of subjects, most of which were resolved as a solution was found. Joseph Danko, Danko Pattern & Mfg. Co., Baltimore, Md., gave an account of his recent tour of European foundries while attending the International Foundry Congress.

—*Henry M. Witmyer.*

Texas

Approximately 120 Texas Chapter members and guests, which included 30 Texas A & M Student Chapter members, took advantage of the Lone Star Steel Co. plant tour as part of the November meeting of the Texas Chapter. Speaker of the evening was Sam F. Carter, American Cast Iron Pipe Co., Birmingham, Ala. His subject was "Some Factors in Cupola Control" and he illustrated his talk by the use of slides.

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Seated at speakers table at November meeting of Wisconsin Chapter are from left to right: Chapter President, A. F. Pfeiffer; AFS National Director, M. A. Fladoes, and AFS Secretary-Treasurer, Wm. W. Maloney. *Photo courtesy W. Napp, Delta Oil Products Co.*

Dr. Frank Rote, Michigan State College Student Chapter industrial advisor, left and Student Chapter Chairman, Bruce Harding, right, at first Fall-Term Meeting.

Chapter News

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The December 4, meeting of the Texas Chapter and the Texas A & M Student Chapter was held at Texas A & M College, College Station, Texas. Approximately 75 members and guests attended and the dinner meeting was preceded by a visitation of the College's Foundry Curriculum facilities; a luncheon meeting of all the Texas Sectional Chairmen; and a Texas Chapter Directors Meeting in the Student Senate Chamber. The dinner meeting program was handled by the Student Chapter. Kent Marshall, Student Chapter president, introduced John Mitchell, who reported on A&M foundry progress; Carl Livesay, Student Chapter secretary introduced Stewart F. Brown, Pattern Shop Instructor; Edward Kranz, foundry instructor, and Professor C. W. Crawford, head of mechanical engineering dept. at A & M.

Thirty-six members and guests of the Texas Chapter, San Antonio Section, attended the December meeting at Alamo Iron Works. E. C. Brown, Whiting Corp., showed a film, "Mechanization From Yard to Ladle" and a color film on manufacturing of refractories entitled "Master of Fire, Servant of Industry" was shown by Freeman Henage and Charles Perry of A. P. Green Fire Brick Co. —*Wm. A. Bearden and Edw. W. Pruske.*

Philadelphia

The November meeting of the Philadelphia Chapter was a technical session of "Sand", the main speaker being Jack L. Stevens, Bethlehem Steel Co., Bethlehem, Pa. His talk covered the practical aspects as well as technical details of molding and core sands. The use of additives, and the various classes of same were discussed. Defects caused by sand and the remedy for them caused quite a debate, as some of the members sought to air their pet thoughts on the same subjects. Following the talk by Mr. Stevens, the meeting was open for a discussion led by Clyde Jenni, and three panel members, who were to ask and answer all questions from the floor. About 265 members and guests attended the dinner and talk.

Over 600 attended the Xmas party at the Benjamin Franklin Hotel —*C. R. Sweeny.*

Western Michigan

Chairman, F. J. DeHudy, Centrifugal Foundry Co., Muskegon, Mich., presided at the meeting of the Western Michigan Chapter at Cottage Inn, Muskegon, Mich., Dec. 7. J. A. Van Haver, Sealed Power Corp., Muskegon Heights, Mich., chapter vice-chairman, introduced the speaker for the evening, Tom Barlow, sales manager, Eastern Clay Products. His presentation of "High Pressure Molding" revealed the progress being made on one of the foundry industry's newer developments, utilizing a combination of plastic bonded sand and extremely high machine pressures for molding. The intense interest of the group was revealed by a lively discussion period and examination of the experimental castings following the presentation.

The chapter presented its Eleventh Annual Informal Ladies Night Christmas Party on December 11, at Spring Lake Country Club, Spring Lake, Michigan. The event was a dinner-dance attended by 110 couples consisting of chapter members and their ladies. —*Wilson W. Hicks.*

Quad City

Quad City Chapter reports the following changes in its board of directors: Stan Olson, Warren Welling, Ed Peterson and Frank Keller; replace Boyd Hays, Leo Jackson Lee Ingersoll and Roy Ray. —*R. E. Miller.*

Rochester

Ray Olson, Production Pattern and Foundry Co., Chicopee, Mass., was guest speaker at the December meeting of the Rochester Chapter, held in the Ontario Room of the Hotel Seneca. "Patterns for Shell Molding," was the speaker's subject. In the process of producing shell molds, it was pointed out, the pattern plates are heated to temperatures up to 500 F. These pattern plates are invested with resin bonded sands. The patterns acquire a shell thickness of $\frac{3}{16}$ in. to $\frac{3}{8}$ in., depending upon the bonding material and the temperature of the pattern. Shells are stripped from the plates, sealed together by resin materials and are then ready for the metal, Mr. Olson said. In the production of the pattern, he stated, the pattern maker should realize that this pattern should be made to the same standard shrinkage that normally is used in the making of patterns for any other method. It has also been found that holes for bolts, etc., $\frac{1}{2}$ in. or larger can be made in shell molds without allowing any draft. —*H. G. Stellwagen.*

St. Louis

The "D" Process of Molding, as developed by the Harry Dietert Co., was the subject of the address at the December meeting of the St. Louis Chapter. Over 170 members turned out to hear about this new method of dry sand molding as presented by Warner B. Bishop, manager, Foundry Products Div., Archer-Daniels-Midland Co. The speaker illustrated his talk with slides to show the actual steps in the casting of metals by this new method. He discussed the advantages and disadvantages and compared the process with conventional methods of casting and with the "C" process.

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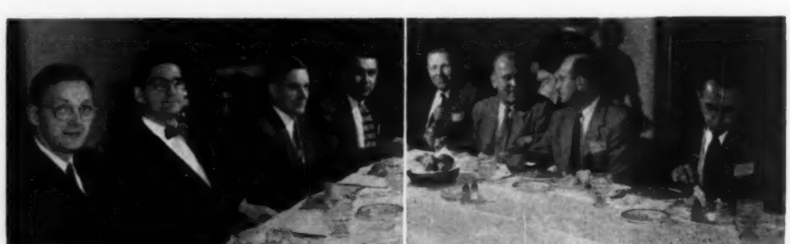

Speakers table at the December meeting of the Chicago Chapter from left to right: Peder Moluf, Robert Dalton, George Posanke, Harold Reckart, Ed. Johnson, Roy Nelsen, Robert Aeberly, and Lyle Clark.

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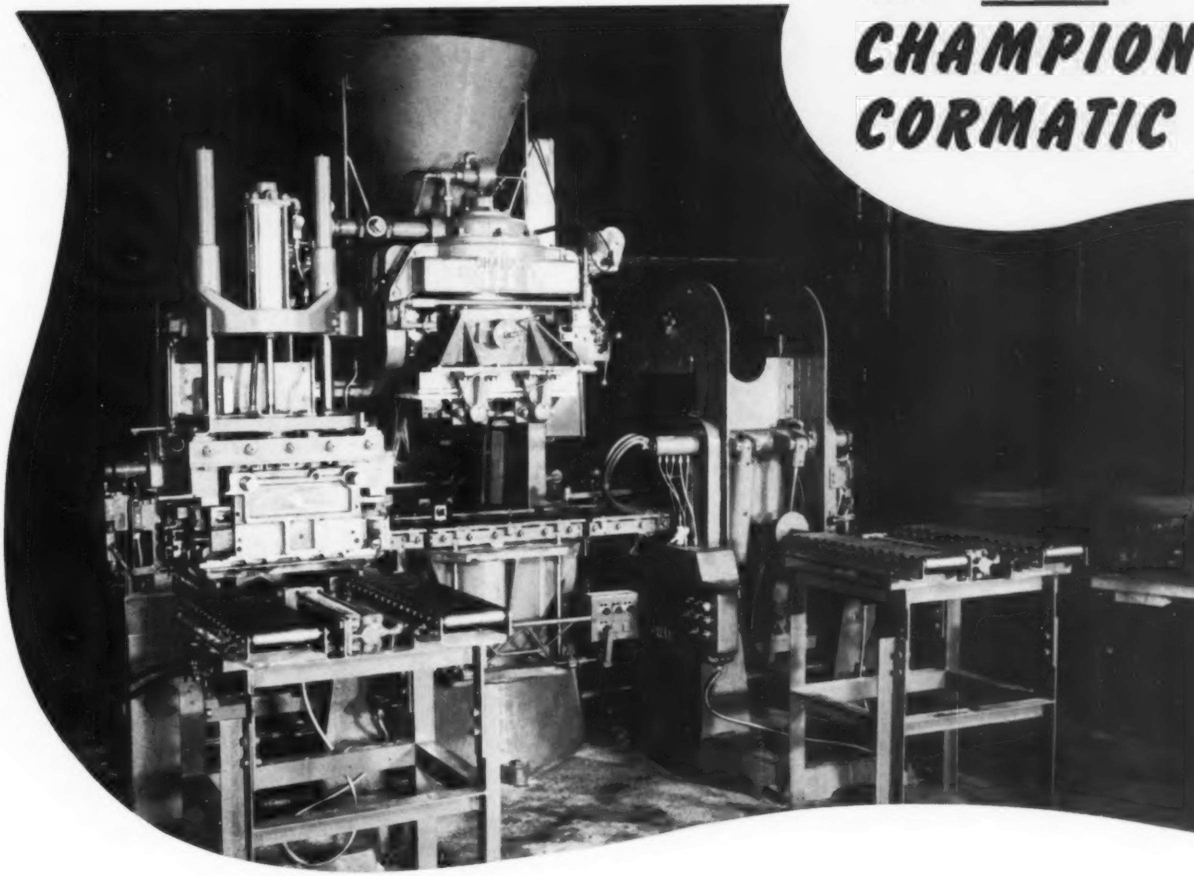

A complete core . . . blown, rolled over, and drawn in eleven seconds or less . . . that's the performance of the new Champion Dual Cormatic Units. Two high-speed Rol-A-Cor Machines are coupled with a single Blomatic Core Blower permitting one operator to attain rates of production far above those possible on any other core production unit. The units are available in several sizes to accommodate a wide range of cores and varying rollover and draw requirements. On one automotive core production job, a four-way draw is handled without difficulty on a Cormatic Unit.

Single Cormatic Units, with only one rollover machine, are also available, as well as a complete line of Champion Core Blowers. Each machine offers unexcelled dependability and high man-hour productivity. Productivity that will permit you to operate your core room at minimum cost. All Champions offer air economy as well as man-hour economy. Champions are noted for low air consumption and minimum air pressure operation.

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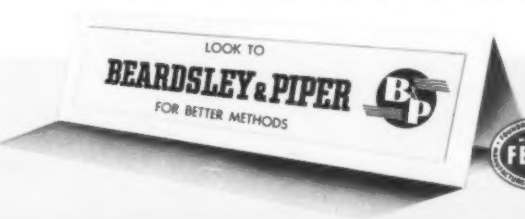

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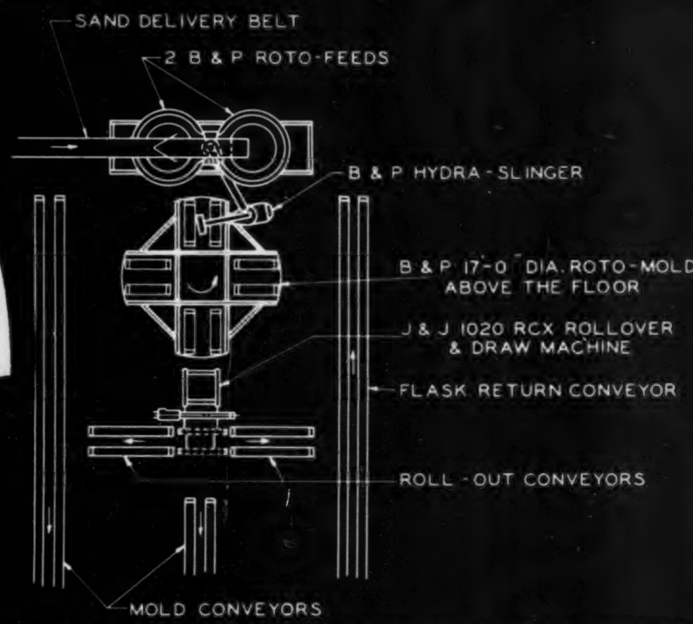


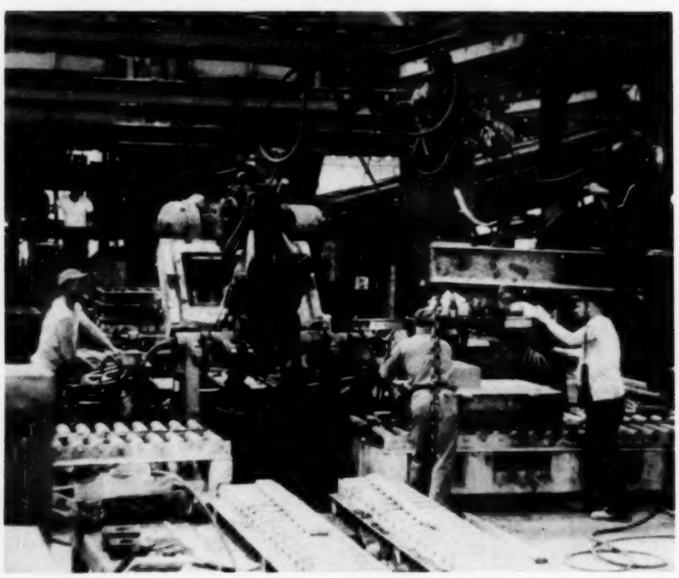
B & P TURNTABLE WITH HYDRA-SLINGER AND J & J ROLLOVER DRAW

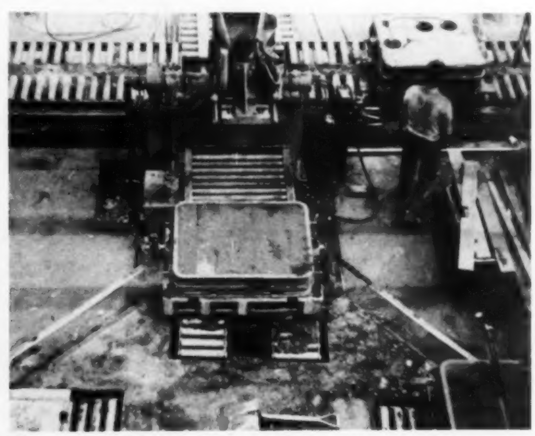
Many Different Patterns Daily Without Pattern Change Downtime

The exceptional molding flexibility required by the Riverside Foundry at Bettendorf, Iowa could only have been realized with a new B & P Above-Floor Turntable Hydra-Slinger molding unit. Riverside must produce molds of greatly varying size from a large number of different patterns each day. That's the exact job these new units are designed to accomplish. They are the answer to your molding problem where flexibility *and* production are important.

At Riverside, both wooden and metal patterns are handled with ease. Two B & P Roto-Feed plate feeders supply Speedmullor mulled facing and backing sand for the Hydra-Slinger. A new J & J 1020 RCX Rollover Draw machine handles all molds rammed on the unit. Like the Turntable itself, J & J Rollover Draw Machines require *no pits* for installation.

Most important, these new units are not only inexpensive to install, but also require less man-power than molding units offering comparable production. Riverside's full story is featured in "Better Methods." Write today for your copy, or to arrange for a demonstration at a nearby foundry.





The J & J 1020 RCX Rollover Draw Machine in action. Molds are rolled directly from the turntable, in the foreground, into the machine. Patterns are returned on the machine after the molds are drawn. No manual handling of molds or patterns.

A view of the new unit. The Hydra-Slinger operator, in the background, controls the slinger from his elevated platform, thus eliminating fatigue and permitting more uniform molding.

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Chapter News

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A Christmas touch was added to the meeting with the awarding of attendance prizes donated by the local suppliers. Entertainment Chairman, John O'Meara, Banner Iron Works, announced details of the Spring Dinner Dance to be held May 1st at Norwood Hills Country Club.

—*J. R. Bodine, Jr.*

View of speakers table at Christmas party of Metropolitan Chapter held at the Essex House, Newark, N. J. ***Photos courtesy John Bing, Metropolitan Refractories Corp.***

Chicago

John Rassenfoss, president of the Chicago Chapter, paid tribute to Deming H. Lucas for his long-time direction of chapter membership activities in announcing reorganization of membership operations at the December meeting. New director of membership activities is J. E. Johnson, chapter director, with R. P. Schauss, also a chapter director, as co-chairman. Each division is to be represented by a divisional membership chairman as follows: Pattern, H. K. Swanson; Steel, Wilbur Eigleman; Gray Iron, J. F. Woodell; Malleable, C. R. Sorensen, and Non-Ferrous, W. D. Danks.

Lyle Clark, Armour Research Foundation, addressed the joint Gray Iron and Malleable group. He spoke on cupola control with reference to incoming raw material. Slides were used to illustrate his talk. At the joint Non-Ferrous and Pattern group meeting, Peder Moluf, Dow Chemical Co., described use of magnesium for flasks, bottom boards, core plates, patterns, core boxes, grinding jigs, and elevator buckets. He recommended steel facing for the wearing surfaces of magnesium core boxes and longer-wearing metals as inserts in high-wear areas inside core boxes. Weathering of magnesium flasks compares favorably with weathering of steel flasks stored under similar conditions, Moluf said. The lower weight of magnesium patterns and flasks permits use of smaller, faster molding equipment, he declared. Shakeout Maintenance was discussed by G. P. Posanke, Crane Co., at the Maintenance Session. It was pointed out that it is not only necessary to keep the shakeout machines in operating condition to maintain production but also all the allied equipment necessary to bring the work to the shakeout machines and also to take away the castings and flasks that have been shaken out. The Steel Division held a panel discussion of Steel Casting Designs. John Mulholland, E. Gricus and G. DiSylvestro comprised the panel. Slides were used to illustrate designs from the elementry to the most detailed stage.

Chairmen for the four sessions were: Gray Iron and Malleable, Robert Aeberly; Non-Ferrous and Pattern, Robert Dalton; Maintenance, Harold Reckart, and Steel, Roy Nelsen.

A movie, "Technique For Tomorrow," showing Ford Motor Company's new Cleveland foundry, preceeded the January Round Table Meeting of the Chapter held at the Chicago Bar Association. Speaker at the Maintenance Division Session was E. W. Greenlees, Kensington Steel Co.; and Harold Reckart, National Malleable & Steel Castings Co., acted as chairman. Mr. Greenlees confined his talk to the operation and preventative maintenance of Jolt Rollover, Pin Lift and Sandslinger Molding Machines. He pointed out with interest the number of molding machine types that are available for our application and usage.

The Non-Ferrous Division heard the Fracture Test Report of the Brass and Bronze Committee from Fred L. Riddell, H. Kramer & Co. Robert F. Dalton, Electronicast, Inc., was Chairman for the session.

"The Effect of pH Factor on Steel Castings," was the subject of Jerry Grott, Unitcast Corp., Toledo, Ohio, at the Steel Division Session. Chairman for the session was Roy C. Nelsen, Sterling Wheelbarrow Co.

"The foundry was an art, not a science, 35 years ago," B. C. Yearley, National Malleable & Steel Castings Co., Cleveland, told the malleable division audience. Consequently, he continued, metal casting labored under an air of mystery that required years to penetrate.

Now, Yearley said, there are no mysteries in the foundry, if we use all of the knowledge available to the industry. In fact, the only real mystery remaining is why foundrymen fail to utilize all of the specialized knowledge that has accrued in the literature and the research laboratory.

Mr. Yearley's talk was titled "Foundry Mysteries," and was delivered to a session that was chairmaned by Richard Utz, National Malleable & Steel Castings Co., Cicero, Ill.

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John Mitchell, A & M Student, left; and Carl Livesay, secretary A & M Student Chapter, both speakers at the joint student and Texas Chapter meeting.

J. A. Gitzen, guest speaker at the November Meeting of the Northwestern Pennsylvania Chapter is shown at left. Center is Bailey D. Herrington, Vice-Chairman and right, AFS National Director H. G. Robertson.

Attending the Steel Session at the December meeting of the Chicago Chapter are left to right: J. C. Mulholland, Roy Nelsen, Geo. DiSylvestro, and Ed. Gricus.

Speakers at a panel discussion at the December meeting of the Saginaw Valley Chapter were: John Kane, second from left; Herbert T. Walworth, center; and William N. Davis, second from right; Chapter Chairman F. J. McDonald is shown at right and Vice-Chairman W. W. Holden at left.

Two group shots taken at Northeastern Ohio Chapter Christmas party. ***Photos courtesy Thomas Gallagher, Lake City Malleable Co.***

Attending Michigan State College Student Chapter's first Fall meeting is student industrial advisor, Kenneth Priestley, right, and Richard McClaughry, student, left.

Speakers table at A & M Chapter meeting from left to right: S. E. Brown, pattern shop instructor; Edward Kranz, foundry instructor; Kent Marshall, A & M Student Chapter president; Israel Smith, Texas Chapter chariman; and Prof. C. W. Crawford, head of A & M mechanical engineering dept.

Attending the Youth Encouragement Night Meeting of the Central Michigan Chapter in November are from left to right, A. C. Hensel, educational committee chairman, Albion Malleable Iron Co.; Wally Weber, freshman coach, University of Michigan, and John Wolf, chapter chairman, Midwest Foundry Co. Photo, M. Lillie Studio.

Visitors inspecting finished castings at the Lynchburg Foundry Co. plant tour of the Chesapeake Chapter.

View of the speakers table at the Northwest Regional Foundry Conference banquet. From left to right, James T. Dorigan, Electric Steel Foundry; Charles Utterback, student, Oregon State College, Howard Havies, Vivian Diesels & Munitions, Ltd.; M. J. O'Brien, Jr., Atlas Foundry & Machine Co.; Prof. Warren E. Tomlinson, and Charles M. Anderson, Eagle Brass Foundry Co.

Chapter News

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Canton District

The Canton District Chapter held its regular meeting at the Barberton Elks Club, Barberton, Ohio, December 3. Present were 100 members and guests. William S. Pellini, Naval Research Laboratory, Washington, D. C., was the speaker and his subject was "Feeding Range of Risers," He presented in his talk simple formulas to determine number, size and placement of risers on steel castings to eliminate shrinkage. Also discussed was the use of proper size and placement of chills to increase the feeding range of risers. Chapter Chairman, Robert A. Epps, Stoller Chemical Co., presided. Alfred S. Morgan, Babcock & Wilcox Co., introduced the evening's speaker.—*R. R. Kozinski*

Other Organizations

Connecticut NFFA

Connecticut Non-Ferrous Foundrymen's Association held its November meeting at the Garde Hotel, New Haven, Conn. Warner B. Bishop, Archer-Daniels-Midland Co., was guest speaker and his subject was: "The ADM-D Process of Shell Molding." It was pointed out that the ADM-D Process has been developed jointly by the Archer-Daniels-Midland Co.; Harry W. Dietert Co., and Auto Specialties Mfg. Co. It differs from the regular method of shell molding in that little special equipment is needed beyond that normally found in the sand foundry, it is claimed. The process consists essentially in blowing mold halves on standard core blowers, using simply a mixture of fine, dry sand with a special liquid binder and contoured driers. Any good core sand appears to be suitable for use in the process. The binder is an oleoresinous mixture developed especially for the "D" process by Archer-Daniels-Midland Co., it is claimed. The driers differ from standard driers in that they are used to form the back of the shell as well as give the mold support during curing, it was said.—*John V. McCarthy.*

Obituaries

Pat Dwyer, 78, died January 9 at St. John's Hospital after an illness of several months. He was Engineering Editor of *The Foundry* for the past 34 years. He was noted for his articles "The Adventures of Bill," appearing in *The Foundry* and also for his book, "Gates and Risers for Castings." In recognition for his many contributions to the industry, he was awarded Honorary Life Membership in AFS, in 1942.

Charles O. Burgess, 51, technical director, Gray Iron Founders' Society, died January 13 in Cleveland.

Ray H. Moore, 61, died recently. He was consulting engineer with Claude B. Schneible Co., Detroit for the past 14 years. Prior to joining Schneible he was with National Engineering Co., Chicago, for 15 years.

John A. Leiske, 80, retired superintendent of foundries and pattern shops at Allis-Chalmers Mfg. Co., died December 15 in Milwaukee. At the time of his retirement in 1950, Leiske had been with Allis-Chalmers continuously for more than 60 years. He was affiliated with AFS and served on various of its committees.

Robert Malcom, Sr., 82, chairman of the board of Chicago Eye Shield Co., Chicago, died recently. He was responsible for the design and development of a variety of safety equipment for head and eye protection.

J. Walter Jeffrey, 73, director and former vice-president of Jeffrey Manufacturing Co., Columbus, Ohio, died recently. He retired from the firm 10 years ago.

Raymond P. Scully, president, Scully Machinery & Equipment Co., Chicago, died in November. Prior to the organization of his own company in 1942, he was vice-president of Scully-Jones & Co., Chicago.

Edmund P. Kinne, 78, former mechanical engineer at the Alliance, Ohio, plant of American Steel Foundries, Chicago, died recently. He retired from the firm in 1946.

William G. Mealor, owner of Gainesville Iron Works, Gainesville, Ga., died recently.

Arthur M. Barker, owner of Barker Foundry & Supply Co., Los Angeles, Cal. died in November. He was 66 years old.

SAND HANDLING
Dust Control Systems
by KIRK AND BLUM

Dust is efficiently removed in the sand handling department of a large well-known steel foundry . . . as illustrated in these photos of a typical KIRK & BLUM Foundry Dust Control System.

One of many KIRK & BLUM foundry applications, this installation meets every requirement of the American Foundryman's Association code; heavy gauge piping has flanged joints and convenient clean-out doors.

Don't let dust foul up expanding production plans. Whether you need a new dust control system . . . or more capacity in an existing one . . . contact KIRK & BLUM, specialists in dust and fume control for more than 44 years. They'll gladly prove the money-saving efficiency of KIRK & BLUM dust control systems.

For informative booklet, write: The Kirk & Blum Mfg. Company, 3108 Forrer St., Cincinnati 9, Ohio.

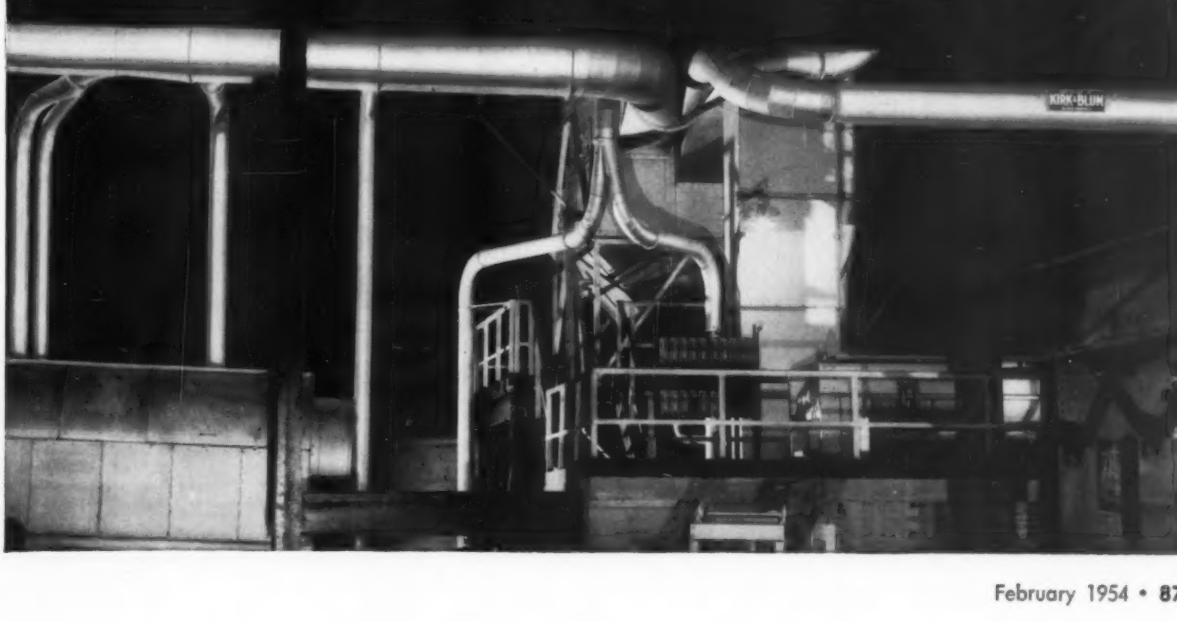
FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM
DUST CONTROL SYSTEMS

Dust Control connections to Simpson Mixers in right foreground.

Kirk & Blum Dust Control on a Rotary Breaker Screen.

View of sand handling equipment with rotary breaker screen on the left.



Operations in the foundry at Greenlee Brothers & Company had been hampered by excessive smoke and fumes. Smoke, which resulted from burning of residual oil and flour, and fumes from core ovens made it impossible for crane operators to work at maximum efficiency. Installation of Dravo Crane Cab Conditioners eliminated these intolerable conditions, greatly improving the efficiency and alertness of crane operators while safe-guarding their health.

Dravo Crane Cab Conditioners are ruggedly-constructed ventilating units, fabricated specifically for rough industrial usage and are especially designed for conditions which require fume removal. These units provide a continuous supply of air from which dust and dirt has been removed. Electric strip heaters maintain temperatures of 68° to 72° F. in crane cabs during winter months.

These units can be easily installed vertically, horizontally, or at any angle which space permits. A separate control cabinet allows on-off operations and regulates heat. Dravo Crane Cab Conditioners are also ideal for installation on mobile cranes, pulpits and other equipment operating where similar conditions exist.

Only Dravo has a complete line of crane cab coolers and conditioners. All units are available now! Write or phone your nearest Dravo office today for more information and have our representative call on you. Ask for Bulletin No. PS-130 -1

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This metal will be ROCKED and SPUN to make a better casting

Detroit Electric Furnaces melt both ferrous and nonferrous alloys at Shenango's Centrifugal Casting Division, Dover, Ohio.

Six Detroit Rocking Electric Furnaces melt alloys for huge centrifugally cast sleeves, rings and fabric rolls at Shenango-Penn Mold Company. These fast melting Detroit Furnaces achieve the close control of temperature and metal analysis required, producing better centrifugal castings with fewer rejects.

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The versatile Detroit Rocking Electric Furnace melts ferrous or nonferrous metals with speed and economy. Send us your melting requirements and our engineers will show you how "Detroit's" can do a better melting job for you. Write today!

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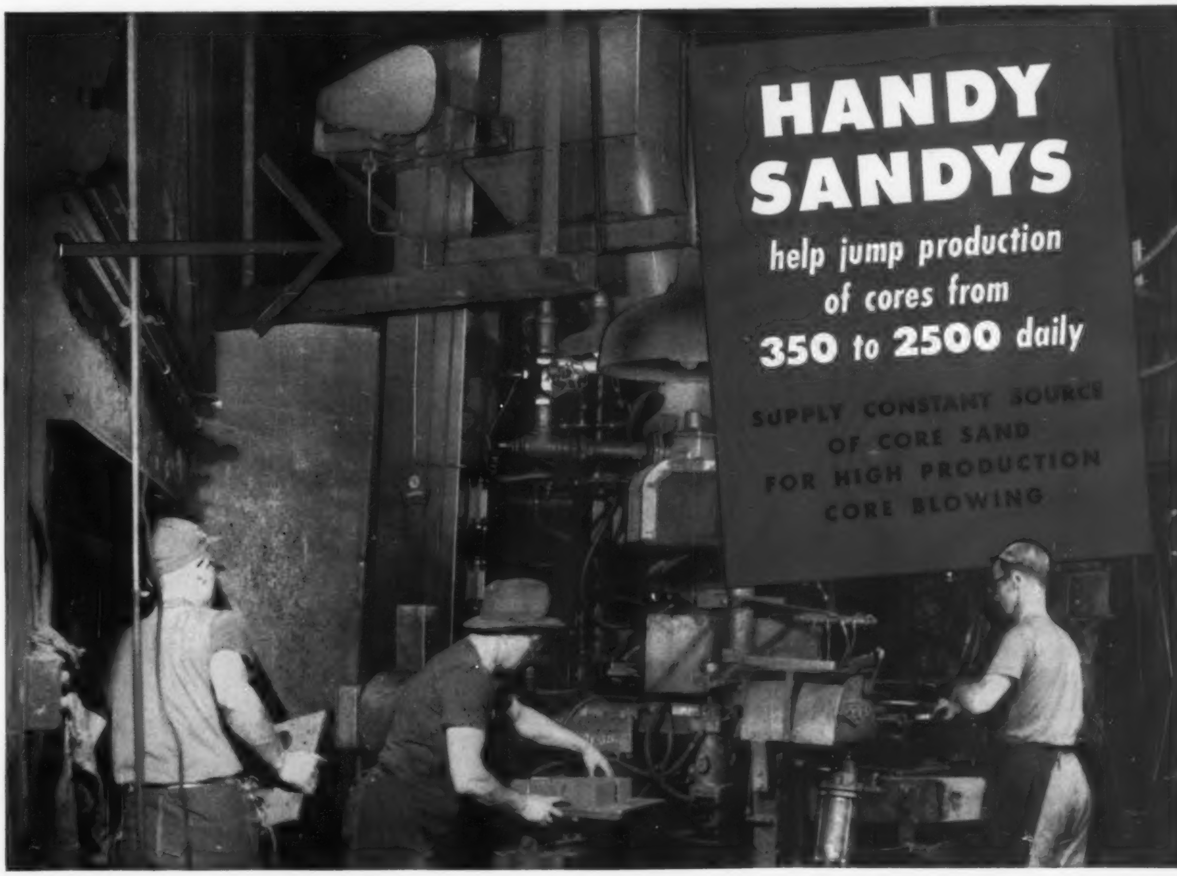


Lakey Foundry and Machine Co., Muskegon, Michigan, had the problem of how to turn out cores in greater numbers, faster and at less cost.

Previously the cores were made by hand ramming, and one man could make up to 350 cores per 8-hour day. Now the Newaygo Handy Sandy in conjunction with a Rotary Core Blower can put out well over 300 cores per hour, or at least 2,500 cores per 8-hour day. Three men work on the unit.

A second Handy Sandy has been recently installed to operate in conjunction with a large Core Blowing Machine and a Core Rollover which when in full production will blow cores at 100 cores per hour with 1 man as against the hand method of 35 per hour per man.

Regular Handy Sandys were installed, with special storage hoppers and wing boards and special feed hoppers, developed by Newaygo to meet the problem of lack of space in the core room. The storage hoppers are fed by overhead trams that periodically drop core sand into them, from which the sand is elevated overhead into the special feed hoppers and directly into the core blowing units. Each Handy Sandy is capable of feeding over 8 tons of core sand per hour to each core blowing unit. The cores average from 14 to 50 lbs. each.

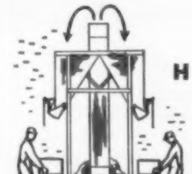
The primary purpose of the Handy Sandys in these installations is to provide core sand for *high production core blowing at low cost.* The units are practically maintenance free, and being fully automatic, eliminate hand ramming and shoveling of any type.

HANDY SANDY

puts sand overhead, eliminating shoveling for the molder.

REDDY SANDY

takes the hard work out of shakeout and sand preparation.



SUPER HANDY SANDY

a high capacity individual-floor sand handling unit.

"Planned Mechanization for Foundries" is yours for the asking. Write, wire, or phone

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Manufacturers of Newaygo Mold Handling, Sand Handling and Conditioning Equipment

ELECTROMET *Data Sheet*

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Welland, Ontario

Why 3 Per Cent Chrome Steel Makes Good Castings for Wear Resistance

Castings of 3 per cent chromium steel have been used in substantial tonnages, for many years, for various equipment parts demanding good wear resistance. Such castings offer an excellent combination of hardness and toughness. Typical applications are crusher parts used in rock- and ore-crushing equipment, swing hammers for pulverizing coal, railroad switch frogs, gears, pulleys, sheaves, and other castings that must meet severe conditions of wear.

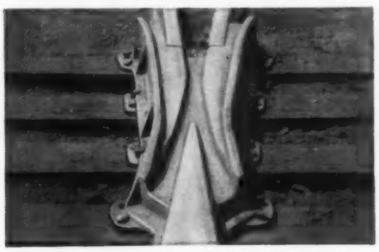

Fig. 1. Railroad switch frogs, which are subject to severe wear, give outstanding service when cast of 3 per cent chromium steel.

The 3 per cent chromium steels, are normally produced in a carbon range of 0.30 to 0.50 per cent. They exhibit excellent depth-hardening properties, which simplify heat-treatment and insure uniformity throughout heavy sections. The analysis is usually modified by a molybdenum addition, since this element aids in increasing hardenability.

Fig. 2. Grating for top of shake-out machine is cast of 3 per cent chromium steel to give good wear resistance and long life.

Properties Improved by Heat-Treatment

The best properties of 3 per cent chromium steels are developed through heat-treatment. Generally, this consists of a normalizing treatment from 1650 deg. F., followed by tempering in a range between 1000 and 1250 deg. F., depending on the physical properties desired. Double normalizing is sometimes used to obtain further improvement in the grain structure. With carbon on the high side of the specification, air-quenched castings show a Brinell hardness number of over 400 in 3-inch sections. This hardness is practically uniform throughout the section. Oil quenching is employed to produce higher hardness and depth of penetration, and even in a 4-inch section, a hardness number of over 500 Brinell is obtained.

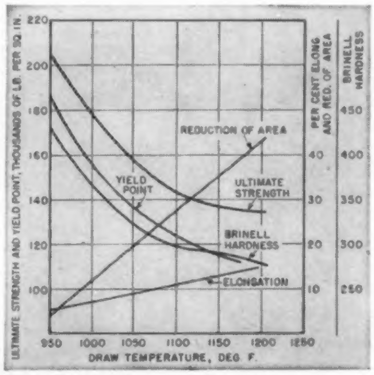

Fig. 3. These curves show the response to tempering of a 0.37 per cent carbon, 2.93 per cent chromium, 0.35 per cent molybdenum steel previously normalized from 1650 deg. F.

The steel also shows good response to tempering. After a normalize and a 1100 deg. F. treatment, it has a tensile strength close to 150,000 pounds per square inch, with an elongation value of about 12 per cent, and a Brinell hardness of about 300. When greater ductility is required, tempering should be done at higher temperatures. However, in such instances, some strength and hardness are sacrificed.

Fig. 4. Photomicrograph of 3 per cent chromium steel normalized from 1650 deg. F. and tempered at 100 deg. F. (X250). The pseudo-martensitic structure is well suited to resist abrasion.

Effect of Other Alloy Additions

Molybdenum in the range from 0.30 to 0.50 per cent will improve depth-hardening characteristics and aid in reducing susceptibility to temper brittleness in the lower temperature ranges. If the molybdenum-bearing steel contains relatively high carbon (0.40 to 0.60 per cent) additions of approximately 0.08 to 0.10 per cent vanadium provide greater uniformity in hardening. Small additions of silicon increase strength and hardness and this element is sometimes increased to 0.80 or 1.00 per cent. Manganese is added in amounts between 0.50 and 0.80 per cent.

Metallurgical Service Available

When you have occasion to produce castings for applications involving severe abrasion and wear, it will pay you to investigate the advantages of using 3 per cent chromium steel. If you need help on some specific metallurgical problem, be sure to consult one of ELECTROMET'S specially trained metallurgists and engineers. For further information, write to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

Building Fund Contributors

continued from page 49

Bunting, Brass & Bronze Co.
Toledo, Ohio
*Campbell, Wyant & Cannon Foundry Co.
Muskegon, Mich.
Canton Malleable Iron Co.
Canton, Ohio
*Carondelet Foundry Co.
St. Louis
Chain Belt Co.
Milwaukee
*Chicago Malleable Castings Co.
Chicago
Cincinnati Milling Machine Co.
Cincinnati
*G. H. Clamer,
Ajax Electro Metallurgical Corp.
Philadelphia
*Continental Gin Co.
Birmingham, Ala.
*Crescent Brass & Pin Co.
Detroit
*Dayton Malleable Iron Co.
Dayton, Ohio
R. J. Denton Co.
Syracuse, N. Y.
*Harry W. Dietert Co.
Detroit
*Dominion Engineering Works
Lachine, Que., Canada
Donald Sales & Mfg. Co.
Milwaukee
*Duncan Foundry & Machine Works, Inc.
Alton, Ill.
Duplex Mfg. & Foundry Co.
Elyria, Ohio
*Ford Motor Co.
Dearborn, Mich.
*Foundry Facings Mfrs. Assn.
Pittsburgh, Pa.
Fremont Foundry Co.
Fremont, Ohio
General Foundries Co.
Milwaukee
*General Foundry & Mfg. Co.
Flint, Mich.
General Malleable Corp.
Waukesha, Wis.
*General Steel Castings Corp.
Granite City, Ill.
Genesee Pattern Works
Rochester, N. Y.
Goulds Pumps
Seneca Falls, N. Y.
*Green Foundry Co.
St. Louis
Hardy Sand Co.
Evansville, Ind.
Louis J. Homan Metals Co.
Cincinnati
*E. F. Houghton & Co. of Canada, Ltd.
Toronto, Ont., Canada

*Illinois Clay Products Co.
Joliet, Ill.
International Fermont Machine Co., Inc.
New York
*International Nickel Co., Inc.
New York
*Interstate Foundry Co., Inc.
Indianapolis
Interstate Smelting & Refining Co.
Chicago
*Ironton Fire Brick Co.
Ironton, Ohio
*Kaukauna Machine Corp.
Kaukauna, Wis.
*Keener Sand & Clay Co.
Columbus, Ohio
Kirk & Blum Mfg. Co.
Cincinnati
*Kolene Corp.
Detroit
Lindberg Foundation of Lindberg Engr. Co.
Chicago
*Locomotive Finished Material Co.
Atchison, Kans.
Los Angeles Steel Casting Co.
Los Angeles
Lunkenheimer Co.
Cincinnati
Luria Bros. & Co.
Cleveland
*H. C. Macaulay Foundry Co.
Berkeley, Calif.
*Massillon Steel Casting Co.
Massillon, Ohio

Medart Co.
St. Louis
*Midvale Mining & Mfg. Co.
St. Louis
Milwaukee Chaplet & Mfg., Inc.
Milwaukee
*Minster Machine Co.
Minster, Ohio
Mission Foundry & Stove Works
San Francisco
Missouri Pattern Works, Inc.
St. Louis
The Moulders Friend
Fort Madison, Iowa
Muncie Malleable Foundry Co.
Muncie, Ind.
D. J. Murray Mfg. Co.
Wausau, Wis.
*National Malleable & Steel Castings Co.
Cleveland
*Neenah Foundry Co.
Neenah, Wis.
O'Hare's Foundry Co.
St. Louis
*Ohio Brass Co.
Mansfield, Ohio
Ohio Ferro-Alloys Corp.
Canton, Ohio
*Ohio Steel Foundry Co.
Lima, Ohio
Oliva & Tatro, Inc.
Los Angeles
*Pangborn Corp.
Hagerstown, Md.
Parker-Street Castings Co.
Cleveland
Pattern Makers, Inc.
Syracuse, N. Y.
Peoria Malleable Castings Co.
Peoria, Ill.
Philadelphia Bronze & Brass Corp.

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Members of Steel Research Committee are shown in October 2 Chicago meeting. From left, standing: H. A. Young, Crane Co., Chicago; J. A. Rassenfoss, American Steel Foundries, East Chicago, Ind.; F. S. Brewster, H. W. Dietert Co., Detroit; C. A. Faist, Burnside Steel Foundry, Chicago; and W. O. Igleman, National Malleable & Steel Casting Co., Melrose Park, Ill. From left, seated: D. C. Zuege, Sivyer Steel Casting Co., Milwaukee; H. J. Heine, Acting AFS Technical Director; Committee Chairman C. H. Wyman, Burnside Steel Foundry Co., Chicago; C. J. Zilch, Bucyrus-Erie Co., South Milwaukee, Wis.; G. W. Johnson, Vanadium Corp. of America, Chicago; K. E. Fritz, Bucyrus-Erie Co., South Milwaukee, Wis.; and H. H. Blosjo, Minneapolis Electric Steel Castings Co., Minneapolis.

Book Reviews

Aluminum in Iron and Steel **. . . by Samuel L. Case and Kent R. Van Horn. 478 pp., 250 fig., 115 tables. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $8.50 (1953).**

First of a new series of Alloys of Iron Monograms, this book combines material drawn from over 340 sources. The first part contains a summary of data showing the favorable effect of small amounts of aluminum when added to molten steel as a deoxidizer. The second part presents a correlation of data on the effect of aluminum as an alloying element in steel. Phenomena of inclusion formation, grain size, notch sensitivity, and aging are extensively treated.

Ferrous Analysis—Modern Practice and Theory **. . . by E. C. Pigott. 736 pp., 64 fig., 25 tables. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $12.50 (Second edition, revised, 1953).**

Detailed examination of each of the 31 major constituents of iron and steel, covering each in a separate section. Treatment of each constituent follows the pattern: quantitative procedure, qualitative properties, analytic properties, appraisal of available processes, provisions against interference, underlying chemistry of the methods, full alloying effects, and bibliography. Sections of the book cover analytical techniques, constituents of iron and steel, microchemical analysis of iron and steel, evaluation of ferroalloys, analysis of iron ores, and refractory materials (including sands).

Mechanical Inspection **. . . by W. H. Armstrong, 361 pp., 280 fig. Published by McGraw-Hill Book Co., Inc., 330 West 42nd st., New York 36, N. Y. $5.50 (1953).**

Primarily for class work and training of inspectors, the book describes and tells how to use the tools used for dimensional inspection of machine shop products and explains the methods used by inspectors. In addition, hardness testing, magnetic particle and radiographic inspection, and statistical control are included. Chapters start with blueprint reading and develop through shop mathematics for inspection, non-precision measuring tools, and precision tools.

Procedures in Experimental Metallurgy **. . . by A. U. Seybolt and J. E. Burke. 340 pp., 147 fig., 22 tables, 186 ref. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.00 (1953).**

Primary object of book is to describe most of the important laboratory techniques used in the preparation of metals and alloy specimens for further study. Techniques such as microscopy, x-ray diffraction, thermal analysis, and mechanical testing are omitted purposely. Subjects covered include methods of obtaining high temperatures, measurement of high temperatures, control of temperature, refractories, controlled atmospheres and vacuum systems, melting and casting, heat treating, fabrication, powder metallurgy, and preparation of pure metals and of single crystals.

Temperature Measurement in Engineering **. . . by H. Dean Baker, E. A. Ryder, and N. H. Baker. 179 pp., 81 fig., 234 ref. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $3.75 (1953).**

This first of two comprehensive volumes discusses temperature accurately, in terms of engineering measurement. Most of Volume I deals with thermocouples. Covered are design, construction, and operation of effective temperature measurement installations in interior points of solids, liquids, gases, and flames. Thoroughly documented.

Elements of Heat Treatment **. . . by George M. Enos and William E. Fontaine. 286 pp., 130 fig., 21 tables. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $5.00 (1953).**

Fundamentals of heat treatment are outlined in this book, an outgrowth of notes used in the first course in metal processing given at Purdue University. Especially useful to those not trained in metallurgy. In addition to customary figures, text includes a number of cartoon-type drawings which illustrate behavior and treatment of metals. Chapter headings are: nature of metals and alloys, mechanical properties, mechanical working, annealing and normalizing, hardening by quenching, tempering, hardenability, alloy steels, surface hardening, cast irons and their heat treatment, heat treatment of non-ferrous metals and alloys, equipment and methods.

Metallurgical Dictionary **. . . by J. G. Henderson and J. M. Bates. 396 pp. Reinhold Publishing Corp., 330 West 42nd St., New York 36, N. Y. $8.50 (1953).**

Over 5000 definitions and descriptions covering essential terms in production and physical metallurgy. Obsolete and remote material has been omitted in favor of such terms as shell molding and flame plating which have recently entered the literature. Related terms are carefully cross-referenced. Valuable to those in metallurgical and related fields as well as specification writers, purchasing agents, architects, and builders.

Building Fund Contributors

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Philadelphia
Phoenix Iron Works
Oakland, Calif.
Pickands-Mather & Co.
Cleveland
*Production Foundry Co.
Oakland, Calif.
Progress Pattern & Foundry Co.
St. Paul, Minn.
*Redford Iron & Equipment Co.
Detroit
Reliable Castings Corp.
Cincinnati
Royall Fire Brick & Supply Co.
Houston, Texas
*St. Louis Malleable Casting Co.
St. Louis
*St. Louis Steel Casting Co.
St. Louis
Sawbrook Steel Castings Co.
Lockland, Ohio
*Claude B. Schneible,
Claude B. Schneible Co.
Detroit
*Claude B. Schneible Co.
Detroit
Simplicity Engineering Co.
Durand, Mich.
Smeeth-Harwood Co.
Chicago
Smith Steel Casting Co.
Marshall, Texas
*Southern California Chapter
Los Angeles
Frank J. Spring & Son
Syracuse, N. Y.
Standard Castings of Cincinnati, Inc.
Cincinnati
State Foundry Co.
Akron, Ohio
Stedman Foundry & Machine Co.
Aurora, Ind.
Sterling Wheelbarrow Co.
Milwaukee
G. Ewing Tait,
Dominion Engineering Works
Lachine, Que., Canada
A. H. Tallman Bronze Co., Ltd.
Hamilton, Ont., Canada
*Texas Foundries, Inc.
Lufkin, Texas
Trinity Valley Iron & Steel Co., Inc.
Fort Worth, Texas
Universal Rundle Corp.
Newcastle, Pa.
Valley Steel Casting Co.
Bay City, Mich.
*Vulcan Foundry Co.
Oakland, Calif.
*Wells Mfg. Co.
Skokie, Ill.
Whiting Corp.
Harvey, Ill.
Williams & Co., Inc.
Pittsburgh, Pa.
Wisconsin Grey Iron Foundry Co.
Milwaukee
*Wolverine Foundry Supply Co.
Detroit
*Woodward Iron Co.
Woodward, Ala.
Walter A. Zeis Fdy. Supplies
& Eqpt.
Webster Groves, Mo.
Zenith Foundry Co.
West Allis, Wis.

Practical Maintenance Hints

For Reduction of Belt Wear

FRED MATHEIS / *Asst. Vice-Pres., Thermoid Co., Trenton, N. J.*

■ All rubber conveyor belts available today have similar construction—essentially carcass and cover. The carcass is made up of one or more plies of cotton fabric duck. For severe flexing conditions, thin sheets of rubber are put between the plies. Covers for conveyor belt are compounded of natural and synthetic rubber together with other ingredients which vary according to the service for which the belt is intended. For severe service, a breaker strip of open mesh fabric is inserted under the cover to give maximum resistance to cover separation.

Although each ply usually extends completely across the width of a belt, a special type known as step-ply construction is available. Belt thickness is uniform but a thicker layer of rubber is provided in the center and additional duck plies at the side. This construction is useful in extreme wear in the middle of the belt as is found with abrasive materials.

Smooth Standard

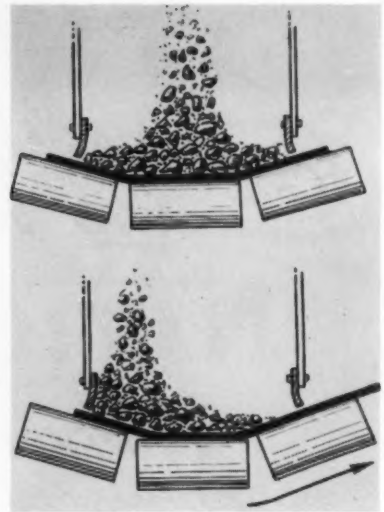
A smooth surface belt is standard in the foundry industry. Usually, in industrial plants the top cover is thicker than the bottom cover because the top cover sustains the most wear, but there is a trend toward use of thicker covers on the bottom in severe abrasive service.

The edges of a belt are carefully sealed in manufacture to prevent moisture from getting into the belt. Excessive edge wear destroys the edge seal. Water will then attack the carcass causing mildew and rot. If the water freezes, the ice particles will rapidly destroy the belt.

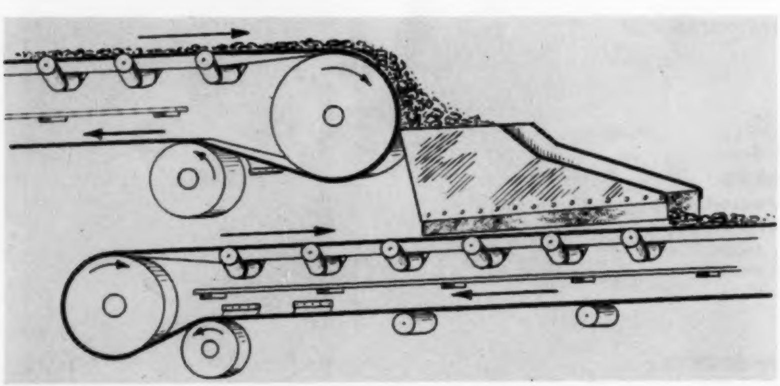
Edge wear is considered by many specialists to be one of the chief causes of short belt life, and misalignment is a large factor in edge wear. It is absolutely essential for long belt life that the belt carriers be correctly aligned. It generally pays off in terms of increased belt life to take considerable time and trouble to secure as close to perfect alignment as possible. Many installations are aligned with a transit. Reducing edge wear usually means a reduction in power.

It is becoming standard practice to compensate for excessive edge wear by cutting off the worn edges before the belt has completely disintegrated and using the reclaimed, narrower belt in less severe service. New liquid neoprene compounds are available for sealing the newly formed edges against moisture. Liquid neoprene is also useful in building up worn spots in the cover to prevent more extensive repairs later.

Skirt boards are another primary source of edge-wear. Construction and placement must be carefully engineered by qualified personnel. The use of jerry-built, "baling wire" contrivances should be avoided. Fasten skirtboards firmly so that they will not eventually loosen and drag on the belt.



Correct loading on center of belt is shown above. When loading is off-side (below) excess edge-wear results.



With correct loading conditions as shown, drop from belt to belt is minimum. Adequate number of idlers around chute prevent spanking or chattering of belt which might allow material to escape under skirt boards. Space between belt and skirt boards increases in direction of travel.

Loading Point a Danger Zone

Loading conditions are a prime factor in belting deterioration. Both existing and proposed installations should be regarded with the intention of creating "ideal" loading conditions. One of the basic requirements for long belt life is that the material falls on the belt while moving in the same direction and at the same speed as the belt (Fig. 1).

The material should be directed on the center of the belt, not toward one side. Material falling on the left side will make the belt ride out toward the right and vice versa. As a result, the belt will not train properly and will rub against guard boards and training idlers, if used, increasing edge wear (Fig. 2).

When lumpy material is being carried, an attempt should be made to have such material cushioned by a prelaid layer of fine material. A screen or "grizzly" at the bottom of the loading chute will satisfactorily deposit a layer of fines over the belting, thus providing protection against bruising. In some instances an oval or "fish tail" notch cut in the lip of the chute will aid in prelaying the fines.

At the same time, the velocity of loading-material flow should be controlled by pitching the loading chute properly. If this is not feasible, a baffle of iron or wooden bars should be constructed in the chute (Fig. 3), suspended from the top and free-swing-

continued on page 100

Quizmaster

These answers to the questions on page 69 are based on the *AFS Glossary of Foundry Terms.*

1. True . . Natural abrasives include emery, corundum, garnet, sand, flint, etc. Main manufactured abrasives are silicon carbide and fused aluminum oxide. Metallic shot and grit are also used as abrasives in cleaning castings.

2. False . . A blocked heat in steel melting is one in which oxidation has been stopped by addition of reducing material, such as pig iron.

3. False . . A cheek is an intermediate section of a flask that is inserted between cope and drag to decrease the difficulty of molding unusual shapes or to fill a need for more than one parting line.

4. False . . Chinese script is a configuration typical of the constituents in cast aluminum alloys containing specific amounts of iron and silicon; applies also to a similar structure found in magnesium alloys containing silicon.

5. True.

6. True.

7. True . . A flux may be acid, basic, a salt, or gas added to metal charge or metal bath to remove sand, ash, and dirt to form a slag. In magnesium melting, the flux also serves as a top covering to prevent further oxidation of the metal by the atmosphere.

8. False . . A grain refiner is any material added to liquid metal for producing a finer grain size in the subsequent casting.

9. False . . This is the name of a molder's heart-shaped trowel.

10. True . . Also known as reverse chill, internal chill, and inverted chill.

11. True.

12. True . . It resembles the keel of a vessel, hence the name.

13. False . . A layout board is a board upon which a pattern layout is made.

14. False . . A misrun is a casting not fully formed resulting from metal poured so cold that it solidified before filling the mold completely.

15. True . . Originally one ounce each of tin, zinc, and lead to one pound of copper, hence the name. It possesses good casting and machining qualities.

16. True.

17. True.

18. False . . A relief sprue is a vertical channel the approximate size of the downsprue connected to the runner to relieve pressure surge during pouring. It functions like a standpipe in a plumbing system.

19. False . . Sharp sand is a sand that is substantially free of bond. The term has no reference to the grain shape.

20. True.

21. False . . Beads of tin-rich, low-melting phase that are found on the surface of bronze castings, sometimes associated with appreciable amounts of dissolved gas in the molten metal, are known as tin sweat.

22. True.

23. True.

24. False . . A Washburn core is a thin core which constricts the riser at the point of attachment to the casting. The thin core heats quickly and promotes feeding of the casting. Riser removal cost is minimized.

25. True.

Now, There's an Idea!

Practical ideas, developed and proved in foundries and pattern shops, are presented in this column. "Now, There's an Idea!" helps *American Foundryman* readers promote the exchange of ideas, the motivating force behind the AFS. Contributions for publication are solicited. They may be of any length, preferably short, illustrated by photo or sketch.

■ When a motor burned out on a sandmill skip loader at the Los Angeles plant of American Manganese Steel Div., American Brake Shoe Co., Bill Skanes, maintenance supervisor, and Austin Ward, mechanic, took over. They hooked the skip loader's cable over pulleys and onto a lift truck. By moving the truck back and forth, they were able to raise and lower the loader, keeping the mill in operation for an entire day so the factory didn't have to shut down until the day's work was done. In the picture, Bill Skanes drives the lift truck to show how it was done. (Item contributed by Walter Anderson, editor, *Brake Shoe News.*)

Reduce Belt Wear

continued from page 98

ing at the bottom, to reduce the velocity of material flow onto the belt.

In like manner, the vertical distance between chute and belting should be small to prevent excessive velocity of material which, in the case of lumpy material, might be great enough to cause belt damage.

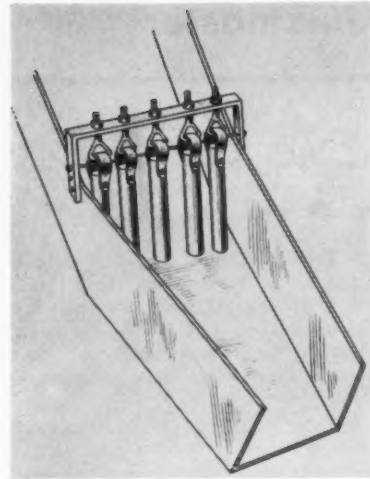
Avoid Pulley

Material should not strike the belt directly above a solid pulley because the resulting hammer-anvil action will quickly render the belting unuseable. The chute should be located so that material will strike the belt between idlers. However, in cases where heavy material is being loaded, it may be necessary to load directly over rubber covered or pneumatic idlers.

In some cases, impact load between idlers will set up belt vibration. Resultant chattering may depress the belt sufficiently to allow material to escape under the skirt-boards. This may be prevented by locating the chute so that loading material will strike the belt far enough ahead of the tail pulley to allow insertion of at least one belt-steadying carrier pulley. Also, carrier pulleys should be more closely spaced around the loading zone because of the impact loading of belt at that point.

Design Loading Chutes Properly

Skirt-boards should not touch the belt but should be positioned slightly above the belt. They should be long enough to settle the material before it



Simple device for preventing excessive velocity of material when conditions prevent more gradual slope of chute. Heavy metal or wood bars are suspended from top and are free to move at bottom. Large fragments are slowed.

leaves the loading area. Flexible skirts are preferably improvised from rubber covered edges of belting remnant. These remnants should be placed so that the rubber-covered edge is next to but not touching the belting. Should this be reversed, and the exposed-fabric edge of remnant placed against the moving belt, grit will collect in the fabric. Resultant abrasive action will, in time, wear a track through the belt cover.

Vertical spacing between chute skirt-boards and belt should increase toward the open end of the chute. Thus the width of flexible skirts, as cut from a belt remnant, should decrease in the direction of belt travel. This construction minimizes spillage around the loading point. At the same time, wedged-in lumps of material will work themselves free by the forward motion of belting during operations.

Review A.S.T.M. Research

The American Society for Testing Materials has announced the availability of reprinted copies of *Review of A.S.T.M. Research,* which comprises material originally published in the December, 1952, and January and February, 1953, issues of the A.S.T.M. Bulletin.

Prepared by the society's administrative committee on research, the pamphlet summarizes the work of the various technical committees of the society, as of May, 1953.

Copies of the 22-page publication are available without charge at A.S.T.M. Headquarters, 1916 Race St., Philadelphia 3, Pa.

F.E.F. College-Industry Conference Program Announced

Foundry Educational Foundation has announced the program for its College-Industry Conference. The two-day sessions are scheduled for March 10-11, 1954 at Cleveland's Hotel Cleveland.

Session I—9:30 am Wednesday, March 10, 1954.

Chairman—E. J. Walsh, executive director, Foundry Educational Foundation.

Welcome—J. T. MacKenzie, president, Foundry Educational Foundation.

Report on the Foundry Industry—Wm. G. Gude, managing editor, *Foundry*.

University Activity:
Northwestern University, University of Alabama, Cornell University, and Pennsylvania State University.

Session II—Lunch

Session III—1:00 pm Wednesday, March 10, 1954.

Chairman—E. J. Walsh, executive director, Foundry Educational Foundation.

University Activity:
Missouri School of Mines, University of Wisconsin, University of Cincinnati, University of Michigan, Michigan State College, and Case Institute of Technology.

Session IV—4:00 pm—Annual Meeting—Foundry Educational Foundation—J. T. MacKenzie, presiding.

Session V—Dinner and Lecture

Chairman—Thomas Kaveny, Jr., vice-president, Foundry Educational Foundation.

Dinner speaker—Dr. J. T. Rettaliate, president, Illinois Institute of Technology.

Session VI—9:30 am Thursday, March 11, 1954.

Chairman—George K. Dreher, Waukesha Foundry Co., Waukesha, Wis.

A. B. Sinnett, Michigan State College, — "An Educational Program at the Secondary School Level."

Panel — "Recruiting for the Foundry Industry."

Moderator—Prof. P. E. Kyle, Cornell University.

E. C. Kubicek, director of placement, Illinois Institute of Technology.

Arthur Bach, placement director, Case Institute of Technology.

A. L. Hunt, manager of industrial sales, National Bearings Div., American Brake Shoe Co., St. Louis.

A. C. Hensel, director, personal relations, Albion, Mich.

Discussion—Summary.

Session VII—Lunch

Session VIII—1:00 pm Thursday, March 11, 1954.

Chairman—George K. Dreher, Waukesha Foundry Co., Waukesha, Wis.

Panel—"Absorption and Utilization of Engineering Talent in the Foundry Industry."

Moderator—R. V. Righter, plant manager, Central Foundry Division, General Motors Corp. Danville, Ill.

E. W. Horlebein, president, Gibson & Kirk Co., Baltimore, Md.

A. E. Rhoads, president, Engineering Castings, Inc., Marshall, Mich.

W. J. Hebard, personnel director, Continental Foundry & Machine Co., East Chicago, Ind.

Additional industry representative—to be announced.

Discussion—Summary.

Conference Summary and Recommendations — Prof. Howard F. Taylor, Massachusetts Institute of Technology.

Hold Ventilation Conference At Michigan State College

The Michigan Department of Health and Michigan State College have again combined their facilities to stage the third annual Industrial Ventilation Conference. The four-day meeting was scheduled for February 22-25, 1954 at the college's Kellogg Center in East Lansing, Mich.

Fundamentals of air flow, ventilation practices, design of exhaust systems, and application of ventilation control to industrial plants were among the general topics to be discussed.

German Society Meets

GATHERING at Düsseldorf on October 9-10, 1953, members of Verein Deutscher Giessereifachleute, the German technical foundry society, heard a program that covered a wide range of industry-related subjects.

Technical sessions opened with the presentation of a colored film on the Feedex process, with commentary by Dr. Ing. Lanzendorfer. The effect of nickel and magnesium on low-carbon steel castings was the general topic of a paper by the late Prof. Dr.-Ing.habil. Piwowarsky. Dr.-Ing.habil. Schwietzke spoke on gas porosity in copper alloys Oberingenieur Forster discussed the influence of work study on the economic efficiency of the foundry.

Radioactive isotopes and their use in foundries were covered by Dr.phil. Sauerwein. He described experiments in this area. Prof. Dr.-Ing. Roesch reviewed the methods of non-destructive testing for detecting castings defects.

The first day's sessions closed with the showing of two short American films on gating techniques. They were presented by Dipl.-Ing. Schneider, with Herr Flottbek as commentator.

Following a general meeting closed to members only, the open sessions were resumed on Saturday, October 10. Prof. Dr. Gutenberg of Cologne University traced new developments in German cost accounting. He was followed by Dr. Chr. Gerthsen of Karlsruhe's Technical College, speaking on: "From Cosmic Radiation to the Cosmotron."

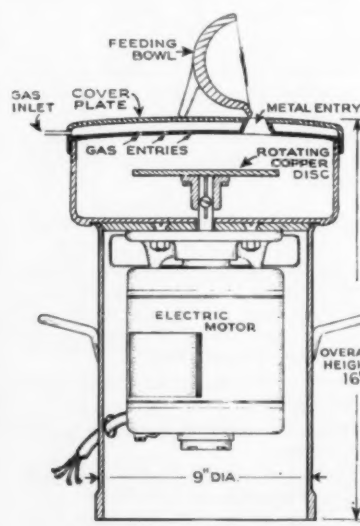
The meeting closed at noon with general concluding remarks about the foundry industry in the West German state.

Members of the Foundry Educational Foundation Industrial-Advisory Committee, under chairmanship of A. L. Hunt, American Brake Shoe Co., are shown at meeting with faculty members of Missouri School of Mines on campus at Rolla, Mo. Topics discussed included employment opportunities in the foundry industry, and progress of the F.E.F. program at the school.

British Develop Rotary Metal Sampling Machine

THE British Steel Castings Research Association has announced the successful development of a rotary metal sampling device. Based upon a design of the late S. Westberg of Rotherham, it enables furnace samples of steel or other metals to be produced in finely granulated or divided form directly from the liquid state and without the necessity for drilling operations. The liquid sample is poured on a rotating copper disc, which centrifugally disperses the metal upon the internal periphery of a surrounding metal bowl.

Prevention from oxidation is necessary during the sampling operation, achieved by providing a high purity nitrogen or inert gas atmosphere in the dispersion cavity of the machine. Gas is admitted through a chambered cover-plate (see diagram).



ROTARY METAL SAMPLING MACHINE

Extended field trials have shown the sampling device to have the necessary degree of reliability and correlation with analyses performed upon orthodox drilled samples. This correlation pertains for the normal elements—carbon, sulphur, silicon, phosphorus and manganese—and also for nickel, chromium, molybdenum and tungsten, over a relatively wide range.

Huge hold-down nut castings, produced by the Meadville (Pa.) plant of the National Bearing Div., American Brake Shoe Co., each weigh 12,278 lb as shipped. Cast from super strength manganese bronze, they required approximately 20,000 lb of metal to pour. The castings were poured at about 1900 F and hot metal was added to the risers while the casting was solidifying. Rough casting dimensions were 43 in. outside diameter by 38 in. high.

AFS Prints Committee Roster, Seeks Used *Transactions*

AFS National Headquarters announces the publication of the 1953-54 National Committee Personnel roster.

The 28-page booklet lists the members of all AFS technical committees, with business affiliations and addresses. Illustrated and printed in color, the pamphlet is available upon written request to the Chicago Headquarters, 616 So. Michigan Avenue, Zone 5.

Transactions Needed

AFS National Headquarters has an urgent need for used, *case-bound* volumes (not quarterly) of the official society publication, *Transactions.*

The years specifically sought are 1930-1952, inclusive. Books must be in good condition and will be purchased at $2.50 each. Mail to Book Section, American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.

Casting Booklet Published

Now available from the Library of Congress, Washington 25, D. C., is a new publication: Advanced Casting Techniques and Processes, consisting of 147 pages, with photographs and blueprints. It was prepared by Alloy Engineering and Casting Co. for the Navy Department's Bureau of Ships and Bureau of Aeronautics.

The publication reports on development work in the casting of high temperature alloys in ceramic molds to conserve material and manpower. The several types of special equipment developed for the centripetal casting process are described and illustrated. The report contains descriptions of new equipment and methods for conserving materials, reducing rejects, and producing more accurate workpieces. Refer to code number PB 109239.

Seven Chain Slings Care & Safety Rules

1. Use specifically designed racks for chain sling storage, arranged so crain hook can be coupled without aid.

2. Keep chain slings free of kinks and twists; lubricate regularly.
3. Never subject chain slings to sudden jerks or jolts when lifting.

4. Keep chain slings clean so possible defects can be easily detected.

5. Never use a single leg of a multiple-leg sling for general purpose lifting.

6. When lifting, distribute loads evenly on each leg of a multiple leg sling.

7. Have chain slings inspected at least twice yearly by qualified chain sling engineers.

—Reprinted from "The Round-Up" published by Round Chain Cos.

Information

continued from page 18

Tractor-Shovel

Bulletin 245 describes ½ cu. yd. tractor-shovel. Safety, visibility, mobility, versatility, speed and ease of operation are explained and illustrated. Frank B. Hough Co.

For more data circle No. 125 on card.

Metablast Process

Booklet describes Metablast process for controlled surface finishing. Photographs show how a pre-determined, consistent finish can be applied to metal parts through the use of a special abrasive suspension applied to parts by means of air pressure. Before and after views of various parts are also included. Metablast Div., American Metaseal Mfg. Corporation.

For more data circle No. 126 on card.

Equipment for Measuring pH

Bulletin 86-K, "pH Meters, Electrodes and Accessories," describes selection and use of equipment for measuring pH, lists instruments, accessories and costs. Instruments include shop and laboratory models. Electrodes available for solutions for moist aggregates and abrasive slurries. Beckman Div., Beckman Instruments, Inc.

For more data circle No. 127 on card.

Enclosed-Tip Thermocouples

Booklet describing and pricing enclosed-tip-thermocouples, stationary units for nonferrous molten metals, complete portable units, thermocouple replacement units, and enclosed-tip thermocouple parts list, is now available. L. H. Maeshall Co.

For more data circle No. 128 on card.

Tumbling Barrels

Illustrated catalog B-9 shows horizontal and tilting-type Globe Tumbling barrels. Special features, such as use of agitator strips and "work shifting" bottoms on tilting barrels are illustrated with drawings and photos. Globe Stamping Div., Hupp Corp.

For more data circle No. 129 on card.

Tilt Furnace

Bulletin 95 describes type SG lever hand tilt furnace. Oil-fired furnace dimensions are given and diagram illustrating features of the furnace are also included. Stroman Furnace & Engineering Co. Div., Peersen Oven Co.

For more data circle No. 130 on card.

Surface Finish

Booklet ED-21703-25M 9-53 tells how surface finish control can reduce machining cost, increase production capacity, and improve a product. It details how surface finish control affects various mechanical, operational and economic factors of a machined part. Brush Electronics Co.

For more data circle No. 131 on card.

Casting Repair Plugs

Casting repair plugs in sizes 1/16 in. to ½ in. in either tapered pipe threads or 27 threads ¾ taper per ft. are described in bulletin published by U. S. Plug & Fitting Co.

For more data circle No. 132 on card.

Sound Film on Ford Cleveland Foundry Available

FORD Motor Co. has recently produced a black and white, sound motion picture showing operations at the new Cleveland foundry.

Although it is a commercial film, it has excellent educational value for schools, universities, or any other organizations working in the field of cast metals. Shown at the January meeting of the AFS Chicago chapter, the film was enthusiastically received by the membership.

There is no charge for the use of the film, which can be obtained by any responsible organization by addressing: Mr. John Sterling, Training Div., Ford Motor Co., Post Office Box 309, Berea, Ohio.

Chapter Meetings

February

1 . . Chicago

Chicago Bar Association, Chicago. National Officers Night. William S. Pellini, Naval Research Laboratory, "Feeding Range of Risers."

1 . . Central Indiana

Anthenaeum, Indianapolis. Wm. Ball, Jr., R. Lavin & Son, Inc. "Effective Essentials To Make Good Castings."

1 . . Western Michigan

Cottage Inn, Muskegon, Mich. Harry Kesseler, Sobro-Mat Process Engineers, "Gating Practice."

1 . . Metropolitan

Essex House, Newark, N. J. Panel Discussion, Shell Molding; W. A. Sokolosky, Monsanto Chemical Co.; E. H. Rubowitz, Newark Pattern Works; Ray Olson, Production Pattern & Foundry Co.

1 . . Central Illinois

American Legion Hall, Peoria, Ill. D. Van Order, Burnside Steel Foundry, "Time Study Methods."

4 . . Canton District

Barberton Elks Club, Barberton, Ohio. Thomas Seaton, American Silica Sand Co., Ottawa, Ill., "Picture and Discussion on A Grain of Sand."

4 . . Saginaw Valley

Fisher's Hotel, Frankenmuth, Mich. Annual Ladies' Night. Dr. K. McFarland, GMC Consultant.

8 . . Rochester

Chamber of Commerce. Joint Meeting with I.M.C., A.E.S., and A.W.S. J. E. Burke, General Electric Co., "Metallurgical Problems in Atomic Power."

8 . . Michiana

Morris Park Country Club, South Bend, Ind. Joint Meeting. R. L. McIlvaine, National Engineering Co., "Foundry Mechanism."

8 . . Cincinnati

Cincinnati Club, Cincinnati, Ohio. Warner B. Bishop, Archer-Daniels-Midland Co., Cleveland, "The ADM-D Process Shell Molding."

8 . . Metropolitan

Schwartz's Restaurant, New York City. Joint meeting with The Society of Non-Destructive Testing. John Erler, Farrel-Birmingham Co., "The Casting Consumer's Viewpoint on Non-Destructive Testing" and G. Lillequist, American Steel Foundries, "The Casting Producer's Viewpoint on Non-Destructive Testing."

9 . . Twin City

Covered Wagon, Minneapolis, Minn. Otto R. Harer, Scientific Cast Products Corp., "Pattern Trends." Film, "Pressure Cast Match Plates."

11-12 . . Wisconsin

Hotel Schroeder, Milwaukee. Wisconsin Regional Conference.

11 . . Northeastern Ohio

Tudor Arms Hotel, Cleveland, Walter Sicha, The Aluminum Co. of America, AFS Film "Effect of Gating Design on Casting Quality."

12 . . Philadelphia

Engineers Club, Philadelphia, Pa. Ralph White, International Nickel Co., "Melt-

Chapter Meetings

ing of Nodular Iron in Basic Lined Cupola."

12 . . Texas

Beaumont, Texas. J. Wesley Cable, The Girdler Co., "Recent Advances in Dielectric Core Baking."

15 . . Quad City

Fort Armstrong Hotel, Rock Island, Ill. William D. Smith, Laclede-Christy Co., St. Louis, "Specialty Refractories For The Foundry."

17 . . Oregon

Heathman Hotel, Portland, Oregon, C. V. Nass, Beardsley & Piper, Div. Pettibone Mulliken Corp., "Mechanization in Core Room."

17 . . Central Michigan

Hart Hotel, Battle Creek, Mich. Beardsley & Piper Film, "Mechanization of Core Molding."

18-19 . . Birmingham

Chattanooga, Tenn. 22nd Annual Southeastern Foundry Conference.

18 . . Detroit

Detroit Leland Hotel, Detroit. Castings Clinic. Harry Gravelin, Ford Motor Co., moderator.

22 . . Northwestern Pennsylvania

Moose Club, Erie, Pa. William Ball, Jr., R. Lavin and Sons, Chicago, "Human Engineering."

26 . . Ontario

Royal York Hotel, Toronto. C. Schureman, Baroid Sales, Chicago.

26 . . Chesapeake

Engineers Club, Baltimore, Md. Clyde B. Jenni, General Steel Castings Co., Eddystone, Pa., "Non-Destructive Testing in the Steel Foundry."

March

1 . . Central Indiana

Anthenaeum, Indianapolis. K. F. Lange, Link-Belt Co., "Foundry Mechanization."

1 . . Western Michigan

Grand Rapids. W. B. George, R. Lavin & Sons, Inc., Chicago, "Metallurgy in Brass Foundry."

1 . . Central Illinois

American Legion Hall, Peoria, Ill. C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., "Mechanization of Core Making."

1 . . Metropolitan

Essex House, Newark, N. J. Round Table Meeting. Robert A. Colton, American Smelting & Refining Co., Non-Ferrous; A. J. Derrick, American Brake Shoe Co., Iron; and Harlie M. Freeman, Taylor-Wharton Iron & Steel Co., Steel.

1 . . Chicago

Chicago Bar Association, Chicago. "Recent Developments in Molding Processes," Tom Barlow, Eastern Clay Products Co., "High Pressure Molding," and Harry W. Dietert, Harry W. Dietert Co., "D Process."

2 . . Rochester

Seneca Hotel, Rochester, N. Y. H. L. Smith, Federated Metals Division, "Brass and Bronze Foundry Practice, Especially Melting Techniques."

4 . . Canton District

Alliance Elks Club, Alliance, Ohio. National Officers Night. Collins L. Carter, AFS National President.

Abstracts

Abstracts below have been prepared by Research Information Service of The John Crerar Library, 86 East Randolph Street, Chicago 1, Ill. For photoduplication of any of the complete articles briefed below, write to Photoduplication Service at the above address, identifying articles fully, and enclosing check for prepayment. Each article of ten pages or fraction thereof is $1.40, including postage. Articles over ten pages are an additional $1.40 for each ten pages. A substantial saving is offered by purchase of coupons in advance. For a brochure describing Crerar's library research service, write to Research Information Service.

■ **A346 . . "Determination of Feeding Systems," Robert A. Cech, *Foundry*, vol. 81, no. 10, October 1953, pp. 128-131.**

Procedure and examples of application of a method of determining feeding requirements of steel castings are given. Method employs three charts showing relationship of feeder diameter to section thickness, length of sound riser tone, and length of sound end zone for various width-thickness ratios.

■ **A347 . . "Some Tools for Quality Control in the Mechanized Jobbing Foundry," Thomas W. Curry, *Foundry*, vol. 81, no. 10, October 1953, pp. 110-113, 214, 216, 217, 220, 222.**

Daily scrap record and trouble-shooting in customers' plants are key points in carrying out quality control work. Scrap meetings, analysis of cost of losses, use of chill tests, melting control, sand control, and the duties of the inspection department are covered.

■ **A348 . . "Choosing the Right Copper-Base Alloy," Harold J. Roast, *Foundry*, vol. 81, no. 10, October 1953, pp. 114-115.**

What inherent qualities are desired in the casting? This is the question a non-ferrous foundry must ask when there is a choice of alloys. Qualities considered by the author are bearing quality, peening quality, wearing quality, anti-corrosion quality, ductility, and pressure tightness.

■ **A349 . . "Coke Quality—Carbon Pick-up," C. R. Austin, *Foundry*, vol. 81, no. 10, October 1953, pp. 116-121, 234.**

While all the tests available for determining coke quality provide some guide as to probable behaviour in the cupola, none seems to furnish a definite index of the rate at which carbon will be taken up from the coke by the charge. Results of tests on five types of coke and one type of graphite are reported.

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Abstracts

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■ **A350 . . "Vacuum Impregnation Makes Porosity-Free Castings," John H. Leary, *Materials & Methods*, vol. 38, no. 3, September 1953, pp. 91-93.**

Reports technique for vacuum impregnation including casting sizes that can be treated, type of impregnants, process details, equipment required, and cost.

■ **A351 . . "How Section Size Influences Strength Properties of Sand Castings," W. J. Reichenecker, *Materials & Methods*, vol. 38, no. 1, July 1953, pp. 80-81.**

As the cast section thickness increases, the unit mechanical properties generally decrease. The susceptibility of some of the non-ferrous casting alloys to loss of mechanical strength with increasing section thickness was studied. Gating and risering techniques were typical, and not necessarily the best. Manganese and aluminum bronze alloys were least affected by varying thickness, tin bronze alloys were considerably affected, heat treated aluminum was not greatly affected, and silicon bronze is little affected in sections below 1½ in. Compositions and properties are tabulated. Proper use of the curves should aid in selecting the right alloy and thickness.

■ **A352 . . "Centrifugal Casting of Cast Iron," Aurelio Possenti, *La Fonderia Italiana*, vol. 2, no. 6, June 1953, pp. 477-482 (in Italian).**

On the occasion of the third anniversary of the death of Aurelio Possenti, one of the originators of centrifugal founding, the initial pages of an article by that author are published for the first time. The manuscript dates probably from 1942; the remaining part has not been found among the author's papers. An outline is given of various early procedures of centrifugal casting, among which is the author's own invention of centrifugal casting in earth molds. Several original drawings by the author are reproduced.

■ **A353 . . "Cost Comparisons of Acid and Basic Cupola Processes," H. Schmidt, *Giesserei*, vol. 40, no. 12, June 11, 1953, pp. 301-304 (in German).**

The basic cupola has only recently been introduced in the German foundry industry. A comparison is made of the respective advantages of the basic and the acid processes, and of production costs involved in both methods. The author points out the preliminary character of his calculations of costs, based on momentary market conditions

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Abstracts

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in Germany, and relative to an industry that has just emerged from the experimental stage. However the computation illustrates the relative effects of the various factors involved.

■ **A354 . . "Contribution to Microscopic Examination of Core Binders," Franz Roll, *Fonderie*, June 1953, pp. 3480-3487 (in French).**

Binders of various consistencies, both liquid and solid, are readily tested with the aid of a microscope, the convenient magnification being 300X. The sample is either simply spread on the slide or mounted in oil, and examined under various optical conditions, such as in ordinary polarized, or ultra-violet light, etc. By using chemical reagents and a heated microscope table, qualitative and semi-quantitative microanalyses can be made. Eighteen microphotographs, obtained with powders, emulsions, starch, clay, crystalline matters, etc., illustrate the method.

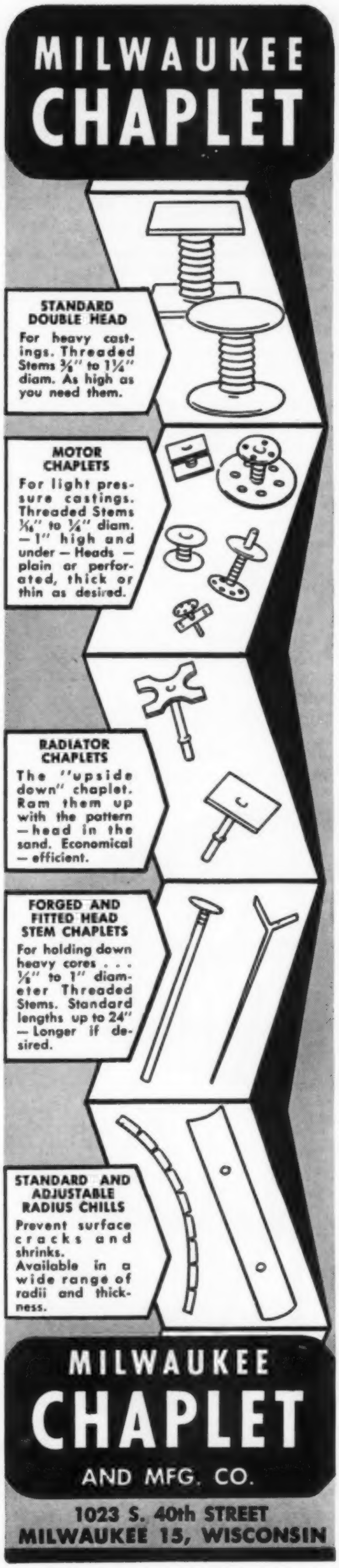
■ **A355 . . "Fluxes for Melting Aluminum Alloys," T. Malmberg and G. Coyet, *Gjuteriet*, vol. 43, no. 6, June 1953, pp. 109-114 (in Swedish).**

A comparative study of various fluxes for melting aluminum alloys showed that complicated compounds present no advantages over the simpler ones, such as potassium and sodium chlorides or cryolyte. The criterion used in these comparisons was the amount of metal losses during the process, this criterion having been recognized as giving more direct and reliable information than that furnished by other methods, such as the evaluation of liberated gases or the examination of polished samples.

■ **A356 . . "System Titanium-Chromium-Iron," R. J. Van Thyne, H. D. Kessler, and M. Hansen, *Journal of Metals*, vol. 5, no. 9, September 1953, pp. 1209-1216.**

Isothermal sections at 50C intervals from 550 to 900 C were used on arc-cast Ti-Cr-Fe alloys to establish the titanium rich part of the diagram down to 70 per cent titanium. The materials used, melting practice, annealing treatments and melting range determinations are studied.

Ternary β solid solutions range continuously from the Ti-Fe to the Ti-Cr system. The eutectoid decomposition of this phase is described. The ternary eutectoid is at 8% Cr- 13% Fe. Solidus and hardness data are presented and diagrams are shown.



THE OLD GANG

We hate to see him come along,
That big-mouthed so-and-so
Who brags about the "Old Gang"
That worked here years ago.
(Quote) "There weren't any helpers
Each molder made his own.
And those old time coremakers
Didn't even need a box;
With eagle eyed precision
They could carve cores out of rocks.
They didn't have air rammers
Or machines to pack their sand.
With peens and shovel handles
They rammed it down by hand.
They worked much longer hours,
Received far less in pay,
And turned out more good castings
Than you guys do today.
No wonder, the way you fellers work,
That the country's on the bum.
Just give me my pick of the old gang,
We'll make this foundry hum.
They were a rugged lot of men,
This old time foundry bunch.
They'd work twelve hours right
straight through
And never stop for lunch.
At night, when they were finished
With drag and cope and core,
They'd go home to their gardens
And work three hours more."
(Unquote)
We let the old boy rattle on
We grin and turn our head.
For where is that old gang today?
Why, most of them are dead!!

From *Rammed Up and Poured,* book of foundry poems by Bill Walkins, available from the copyright owners: Electric Steel Foundry Co., 2141 North West 25th Ave., Portland 10, Oregon. Price, $1.85.

U.S. Film Bibliography

The Office of Technical Services, U.S. Department of Commerce, is now selling a booklet entitled *Bibliography of Motion Pictures and Film Strips—Foundry Practice,* PB 105715.

The publication, listed at 50 cents, catalogs 63 motion pictures and film strips, including those that are industry-sponsored, and others in the collection of the U.S. Office of Education.

The list covers a wide range of foundry subjects which are of particular interest to trade and vocational schools.

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